TAPE TO DISC:
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Fleet St Editor,
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EDUCATION EXTRA
SATELLITE STATION FOR SCHOOLS
PLUS: 7-page guide
to software
AND: Micros as tools

ACORNUSER

ISSUE No 46 MAY 1986

FEATURES

COVER

Cover illustration by
Paul Leith

NEW ADDRESS

Acorn User has moved offices. Our new address is Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF. The phone number remains 01-836 2441.

NEXT MONTH

ROCKFORT

NEWS

News in brief

● Incentive's *Moon Cresta* game offers the chance to win one of the original arcade machines. It runs on the Beeb and Electron at £7.95 on cassette and £2 extra on disc.

On the adventure front, Robico has released *Project Thesius*, a text-only follow-up to *Enthar Seven*. Electron and BBC B cassettes cost £9.95, with Beeb discs £11.95.

Also, the *Midge* text compression system used for the game is available on BBC disc for £11.95.

● Computer Concepts has cut the price of *Wordwise* to £36.80. The *Plus* version stays at £56.35. Versions 1.4D of *Wordwise Plus* and *InterSheet* 1.05 onwards work on the B, B+ and Master.

● Tunemaker from March's *Acorn User* was one of the most popular free programs on Micronet. About 1500 people downloaded it. This month's offering is Peter Voke's *Three Dee Shades* program. See Noticeboard for page numbers.

● Opus has upgraded its Challenger combination disc drive system for the BBC micro to 512k of RAM disc from 256k plus a 40/80 track disc drive and double density disc interface. The price remains the same at £249.95. Opus Supplies (0737) 65080.

The shape of memory to come

Cumana – the company which made its name selling disc drives for BBC micros – has unveiled a revolutionary memory technique: a chip mounted on a credit card.
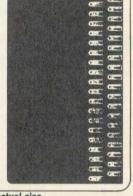
The Astron card, with inexpensive adaptors, will be in the shops this month, first of all in Dixons with a game for the Commodore 64. Initial products will be equivalent to 16k ROM chips, but RAM and EPROM versions are on the way, as well as a 128k product.

Price of the card plus interface will be about £24, with the cards themselves costing £5 – expected to come down to around £3 by December. A battery-backed version is under development.

Cumana is distributing the system for Japanese company Astar International under an exclusive European licence. General Instruments is pushing it in the US.

Astar has repackaged conventional chips by surface mounting them on a sheet of plastic. This is

A 16k chip is embedded in this card shown actual size

already done in Acorn's cartridge software for the Electron and Master but it is the portability of Astar's system which is new.

The first interest in the UK has been from security companies, and the army. The Royal Engineers have been using the cards in the Beeb's serial cartridge slot on the left of the keyboard which is normally covered up.

Cumana's managing director Don Bolton was extremely confident about the new system: 'We see it being very, very big and growing very fast.' He also saw it having revolutionary possibilities for computer hardware, even doing away with traditional RAM and ROM in micros.

The army, he said, was even looking into replacing the conventional 'dog tags' with a card, and the REME had set aside £1 million to develop the system.

At the launch last month Cumana was showing the cards working with BBC micros driving Alfred robots, and Superior Software's *Speech* software. Acorn was there with the Communicator, and talked about the possibilities of putting the card interface on the side of the machine.

Other big names mentioned in connection with the card were Sinclair – which is working on a portable micro called 'Pandora' – and British Telecom.

Acorn has taken one of the 100-or-so development systems that have gone out, although had not had time to design the hardware.

Olivetti to compete with Acorn in schools

Olivetti has launched an IBM PC compatible micro in competition with Acorn's Master 512 for sale to schools.

The M19 will cost about £1400 and be available in May – three months before the Master 512 priced at around £900. Both machines will go into secondary schools to train pupils in business software – which is where the Olivetti machine has the edge as it has a much higher degree of IBM compatibility.

An Acorn spokesperson explained that it was a historical situation which was unlikely to happen again. In fact Acorn joint founder Hermann Hauser has just signed on with Olivetti as director of advanced research and development.

At the launch of the M19 micro, which uses the 8088 processor running PC-DOS and will run standard IBM software such as *Lotus 123*, Olivetti talked about porting BBC micro educational software on to the machine. However, Acorn was unsure as to its involvement in this. Both companies put a brave face on the prospect of competing with each other. An Olivetti spokesperson told *Acorn User*. 'Obviously there is an overlap, but we'd rather see that than a gap'.

Acorn echoed the sentiment: 'We'd rather sell schools an M19 than see them go out and buy anything else'.

Acorn will 'make the M19 available', and it might well carry an Acorn badge, although a firm decision had yet to be taken.

7

THE MAN FROM U.N.C.L.E.

Rats. All excited I was. When the Master was launched they said that the 512 version was based on the Motorola 68000 processor, didn't they? I know I didn't imagine it. Dancing in the streets. Jubilation on a cosmic scale.

However, back at the Acorn Strategic Offence Initiative headquarters, dark plans were afoot to bring the Great British Public back under the yoke. 'Now zat ve haff ze enemy vell and truly drunk, ve go for ze killer blow. Ze next lot of adferts vill announce zat ze processor vill be ze 80186! Ha, Ha.' Same as the IBM PC. Argh! It's like being told that we didn't win at Waterloo after all.

I was at the annual masque ball of the regional chapter of the Ripoff Artists last week. As a guest/observer of course. It was interesting watching these fellows attempting to sell each other life insurance while nicking everything that wasn't nailed down. Discs, ROMs and tapes were moving around the room at flank speed. Similar to 'pass the parcel' except that the passing was involuntary. They seemed to enjoy the dare-devil thrills of sleight of hand more than the programs.

Still, it's not surprising when you consider the state of software. How many more ways are there of simulating the destruction of some poor alien who's probably got a family, mortgage worries and athlete's foot? The greatest innovation is in protection systems. Certainly the shadowy characters at the ball appeared happiest when telling how long it had taken to crack some elaborate piece of code.

I suppose it's like doing crossword puzzles really. I don't like them either.

Schools' unit has no staff

The new body set up to develop computer education in the UK, the Microelectronics Support Unit, has no director, no staff and no premises. The MSU was due to take over on April 1 from the Microelectronics Education Programme (MEP). Yet by that date the Department of Education (DES) had only appointed a board of 11 advisors and a chairman, Mike Nichol.

Without a director, the MSU cannot implement any policies. Without premises or staff the unit is unable to develop materials or provide practical advice to local education authorities.

Acorn User spoke to Mr Nichol just two weeks before his unit was due to take over from the MEP.

He was confident that by the autumn the MSU would be fulfilling the role envisaged by Sir Keith Joseph, the education secretary – a small central support and advisory body. £3 million has been set aside for the MSU in the financial year 1985/6, as against the MEP's £4.5 million in 1984/85.

A former MEP employee said: 'It took the MEP five years to achieve its innovative position. The DES has undone all that work and it could be another five before the MSU is truly functioning in the way Sir Keith Joseph would like.'

Print-a-T-shirt

Instead of dumping your favourite images onto boring listing paper, why not emblazon them across your chest? Slot a transfer printing ribbon into your Epson FX70 or FX80 and text or graphics screens can be printed on a polyester or cotton T-shirt.

The ribbon costs £12.50 and is available from Banbury Business Computers, 3 Schofields Way, Bloxham, Banbury, Oxon.

Musical theory

Nebulae Micro Software has produced a music package for the Beeb which teaches the elements of counterpoint theory.

The software costs £22.95 on disc, and versions for Amcom or Econet networks cost £35.

Nebulae Educational Software, Kilroot Park, Carrickfergus, Co Antrim BT38 7DD.

New Star spotted

The latest addition to the Star range of printers is the NL-10. This dot-matrix printer costs £278, with a parallel interface, and as the name suggests is capable of Near Letter Quality (NLQ) printing at 30 characters per second.

In draft mode, the NL-10 runs at 120 cps. Other features include user-defined characters, an italic font and a headline mode where text is printed at double or quadruple height.

Star Micronics, 40 Uxbridge Road, Ealing, London W5 2BS.

Econet developed for businesses

Plans are afoot to take Acorn's Econet local area networking system out of its present educational niche and into the fast-growing business world.

SJ Research is developing a range of intelligent Econet interfaces for business machines, including the IBM PC which has half the business market.

Three interfaces are being planned, for each of the major computer connection bus standards, including SCSI, allowing the Apple Macintosh to hook up to Econet; the VME bus, as used on Torch's Triple X range; and the IBM PC bus.

SJ Research is working with Torch, Acorn and several large users of Econet to define 'what can and cannot be done with Econet and business computers', according to Kim Spence-Jones, SJ Research's technical director.

Other Econet suppliers prefer to remain anonymous because, according to Spence-Jones, 'there's still a lot of stigma attached to Econet; a feeling that it is a toy network for schools.'

SJ Research is to release a more sophisticated Econet file server, MDFS, which will cost £1200 and will support four disc drives, a hard disc and a tape back-up.

A top-of-the-range HDFS file server with 80 MByte hard disc, tape back-up and triple processors costs £7200. Other new SJ products include a viewdata simulator for Econet and a menu system.

Competitions for schools

Schools using the *Music System* composing software can win an Epson RX80 printer or 40-track disc drive.

The System software house is offering four printers as first prizes – and four disc drives for the runners-up – to the composers of the best pieces of music produced using the software.

There are two categories, classical or contemporary, and the pieces must be less than three minutes long.

Closing date is May 12 1986 and further details are available on (0742) 682321.

Another competition has been launched by Michael Jay Publications for users of its *Cellmap* data collection software.

Prizes of educational software worth £160 are on offer to the most creative school projects which use the software. Entry form from MJP on (0795) 534690.

Beeb control unit

Claydale Electronics has produced a control unit for the Beeb which offers eight opto-isolated inputs and eight relay outputs.

The unit costs £165 plus VAT and up to eight of them can be plugged into the Beeb's 1MHz bus, giving 64 inputs and outputs. One Claydale unit can be powered from the Beeb, but extra ones will require a separate 5V supply.

Claydale Electronics, Unit 1, Bidewell Close, Drayton High Road, Norwich.

Z80 disassembler

Crossware Products has added a disassembler to its Z80 cross-assembler, which runs on the Beeb, B+ or Master 128. The new utility comes on a ROM and costs £69, and can now disassemble Z80 machine code – stored on disc or in RAM – into the full instruction set of Zilog mnemonics. Crossware Products (0763) 61539.

School modem scheme on-line

by Bill Penfold

The Government has increased new funds for putting a modem in every middle and secondary school by 50 per cent because of the sheer scale of the response to its scheme.

In less than a week after the scheme was unveiled by Information Technology Minister Geoffrey Pattie, more than 5000 schools had snatched up the offer, and the overwhelming majority of these orders are to put school BBC micros on line. Now an astonished but delighted Mr Pattie has increased the original £1 million funding to £1.5 million.

Under the scheme schools have been offered free modems plus software, with the promise of a National Computerised Information Service (NERIS) being established for schools before the end of the year. This will initially cover the curriculum areas of maths, science and geography, with other subjects being added.

Whitehall officials had expected some 9000 to 10,000 schools to take up the offer, but the enthusi-astic reaction meant that within days this was revised up to an anticipated 12,000.

The Department of Trade and Industry (DTI) expects that just about every secondary and middle school will have a modem within the next few months.

Two types of modem are being supplied – both of which are already extensively used in some schools – the Tandata 512 and the Dacom DSL 2123AD, normally costing around £200 but which the DTI has bulk-purchased for £110 each.

From mighty Acorns little Beebs grow

Yes, that's a real £1 coin behind the diminutive BBC micro (left) – monitor, copy of *Acorn User* and user guide are all faithfully reproduced at the same 1:10 scale.

This Lilliputian feat was accomplished by *AU* reader Peter Clements, who has been making models as a hobby for seven years.

The Beeb is cast in resin from a mould, and the master took a painstaking two weeks to carve out of epoxy putty. The mould has also been used to cast Beeb badges (*AU* January).

The monitor lights up, thanks to an internal bulb, but the *Revs* screen is unfortunately static – it's simply a colour transparency of a full-size screen shot.

The user guide and copy of *AU* were reduced photographically and the spiral binding is made from fuse wire.

Acornsoft wanted to buy the mini micro and its puny peripherals but said Peter: 'It was just a one-off and is definitely not for sale'.

Micro adventures

Children's adventure holiday firm Dolphin is offering BBC micro computing as an option in its multi-activity adventure centres.

Dolphin, Grosvenor Hall, Bolnore Road, Haywards Heath, West Sussex RH16 4BX.

Graduate's Soft Option

Torch Graduate owners have a new company to go to for support called Soft Options.

The Graduate add-on offers IBM PC compatibility to Beeb owners, and Torch has always maintained that because it runs a large range of IBM PC software there is no need to produce software specifically for the Graduate.

However, A Sherman, one of the Graduate's designers, thinks differently and has set up his own company, Soft Options, to provide a 'much-needed' service for Graduate owners.

Its first release is a £40 utilities disc of seven programs, including one to convert MS-DOS files to Acorn DFS format, and a disc copier which exploits the Graduate's 1770 disc controller chip.

Soft Options, Century House, Swavesey, Cambridge CB4 5QG.

Instant video digitising for the Beeb

Wild Vision has produced a real-time image processing system for the Beeb – the Hawk V8.

The unit costs £970 and stores video images from a monochrome camera in the Beeb's screen memory. Direct memory access (DMA) means that the screen memory is continually updated without burdening the processor.

Unlike cheaper picture digitising systems for the Beeb which scan the image, the Hawk works in real-time, grabbing the image almost instantaneously and displaying it in either mode 0 or mode 2.

The system has already been used for a medical application – studying foot pressure patterns –

and Wild Vision sees other applications as security systems, CAD, industrial inspection and scientific image analysis.

Hawk V8 comes as a board, which sits inside the Beeb's case, and image processing software.

Wild Vision, MARI House, 20-22 Jesmond Road, Newcastle-upon-Tyne NE2 4PQ.

Roma: £4000 from death

The life of Roma the tigress is still in the balance, with £4000 needed before the end of April.

Acorn employee Martin Grantham single-handedly took on the mammoth task of raising over £20,000 to build an enclosure at Linton Zoo, Cambridgeshire for Roma, who was made homeless when Knaresborough Zoo closed (*AU* March).

Response to his appeal has been tremendous, with £17,000 raised by early March – with *AU* readers contributing £750-£1000.

£4000 is still needed, but Mr Grantham is confident he will raise it. If he can't, the RSPCA will put Roma down.

Donations to The Save the Tiger Fund, Midland Bank, 52 St Andrews Street, Cambridge CB2 3AH. A/C no 41118722, sorting code 40-16-36.

Clares adds fonts to printer driver

This is Font one in normal size
This is Font three in normal size
This is Font five in normal size
This is Font seven in normal size
This is Font nine in normal size
This is Font eleven in normal size

𝔗his is 𝔉ont two in normal size
This is Font four in normal size
This is Font six in normal size
This is Font eight in normal size
This is Font ten in normal size

This is Font twelve in normal size

This is Font one in condensed size
This is Font nine in condensed size
This is Font three in condensed size
This is Font eleven in condensed size
This is Font seven in condensed size
This is font twelve in condensed size

Some of the type styles available in Clares' *Fontwise Plus* – not shown to actual size

Clares has released six new pieces of software for the BBC micro and Master series.

Fontwise Plus improves the existing *Fontwise* printer driver so that it now works with *View* files, in addition to *Wordwise* and *Wordwise Plus*. The program allows text files to be printed in 12 type styles on an Epson-compatible printer. Cost is £20.

Macrom is a macro assembler for all Beebs including the Master 128, priced at £40. It will assemble 65C02 code as well as 6502.

Another upgrade, *Brom Plus* enhances the facilities of Clare's

Brom toolkit ROM, which has been reduced to £20. The new version costs £34.50 and has utilities for discs and memory as well as Basic utilities.

Statement and *Stock Control* are the two latest additions to the *Beta Accounts* integrated accounting suite at £25 each.

Finally, Clares has put six of its best educational programs on one disc. *Educational Compendium* costs £12 – buying them separately would set you back £32.

Clares Micro Supplies, 98 Rudheath Road, Rudheath, Northwich, Cheshire CW9 7DA.

POST A PROBLEM

AS a result of pressure from readers, *Acorn User* now guarantees a fast reply service for enquiries. Your answer will be returned within 10 working days for just £2 (includes VAT), or your money back.

The idea is simple. Just write out your problem, fill in the coupon (right), and send both off to *Acorn User* with a stamped addressed envelope and cheque or postal order for £2. (If you want recorded delivery, add the cost of this on. The same goes for overseas readers.) Include as much detail as possible and a disc or cassette if a program is involved – with enough space to record any corrected listing.

We will then answer the problem and return all material received – within a guaranteed *10 working days* from receipt. If we fail to match this promise your cheque or postal order will be returned with the answered question. If we cannot answer the problem, the cheque will be sent back to you.

If you want a listing debugged, advice on hardware or software, or a list of addresses, send us your problems.

ACORN USER READER SERVICE
141-143 Drury Lane, London WC2B 5TF

Name ....

Address ....

....

....

.... Postcode ....

Daytime phone number ....
I enclose a cheque/postal order for £2 and an sae with my problem.
OFFICE USE ONLY Date in:
Date out:
Answered by:

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JUKI 6100 S/S	£1.75	SHINWA CP80	£4.75
JUKI 6100 M/S	£2.75	**TAXAN KAGA**	**£3.25**
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ON SHOW

● 7-9 July, Third Insurance Information Exchange, Connaught Rooms, London WC2. Specialist exhibition including hardware and software for the insurance industry. More details from Caroline Fletcher on 01-242 5275.

● 9 July, Computers in Science, Lancaster Polytechnic, Preston. This event, which is part of a course for further education teachers, will be open to the public. Potential exhibitors contact Mrs Minall at the Polytechnic's Business and Industrial Centre.

● 24-27 July, Acorn User Exhibition, all the experts from *Acorn User* will be on tap at the Barbican in London. More details next month, and see the advertisement in this issue.

● 6-11 August, Festival Expo 86, Computers, Video Software and Games Exhibition, Stoke-on-Trent, Staffs.

One of twenty exhibitions being held between May and October as part of this year's huge National Garden Festival. Over three million visitors are expected to visit the festival's purpose-built 180 acre garden site during the five months it is open.

FOR HELP

● To contact *Acorn User* authors, write to them c/o our new address: 141-143 Drury Lane, London WC2B 5TF.

● Remember you have until May 11 to register with the Data Protection Registrar if you are a business micro user who processes information about individuals. It costs £22 and failure to register is a criminal offence under the Data Protection Act, 1984.

Contact the Data Protection Registrar, Springfield House, Water Lane, Wilmslow, Cheshire SK9 5AX for advice and details.

● Seikosha AP/GP100 printer help sheets are available from *Acorn User* for 50p, plus sae. These consist of three programs, including a screen dump, and three pages of notes on using these printers.

TO CONTACT

● Acorn, Fulbourn Road, Cherry Hinton, Cambridge CB1 4JN. Tel: (0223) 245200.

● Acornsoft, 645 Newmarket Road, Cambridge CB5 8PD. Tel: (0223) 214411.

● Acorn's bulletin board service is Prestel-compatible (1200/75 baud) and runs on (0223) 243642.

● *Acorn User* cassettes, discs, back issues and binders are available from PHS Mailings on (02934) 72208 (see page 104).

● *Acorn User's* page number on Micronet is 60043765. You can download *AU* software on 600611.

● BBC TV's *Micro Live* bulletin board is on 01-579 2288 (type INFO BBC on Telecom Gold electronic mail system).

● BBC Computer Literacy Project, Broadcasting Support Services, PO Box 7, London W3 6XJ. Please send sae.

● British Amateur Radio Teleprinter Group (BARTG) specialises in keyboard communications including RTTY, AMTOR (Amateur Telex Over Radio) and packet radio. BARTG also provides terminal unit kits and other communications hardware. For more details contact: Stuart Dodson, BARTG Chairman, G3PPD, 63 Malvern Avenue, South Harrow, Middlesex.

● Bulletin Boards: Two new bulletin boards are now available. BB-BBS (Brecon Beacons Bulletin Board Service) offers free software and hints and tips. The board operates on 300/300 baud and is currently open between 8pm and 8am on (0874) 730692. On-Line Systems Bulletin Board gives details of Hartlepool Computer Services range of new and second-hand computers. It operates on 1200/75 baud on (0429) 234346.

Other boards: BB-BBS (0874) 730692; CABB 01-631 3076; CBBS London 01-399 2136; Distel 01-679 1888; Forum 80 Hull (0482) 859169; Forum 80 London 01-399 2136; Grendel (0532) 620334; HAM-NET (0482) 497150; Liverpool Mailbox 051-428 8924;

Mailbox 80 (0384) 635336; POT-BUG (0782) 503254; On-Line Systems (0429) 34346; Owltel (BBC Publications) 01-927 5820; Technomatic 01-450 9764; TBBS London 01-348 9400; TBBS Nottingham (0602) 289783; TBBS Southampton (0703) 437200.

● MAPE (Micros and Primary Education), c/o Mrs G Jones, 76 Sudbrooke Holme Drive, Sudbrooke, Lincs LN2 2SF.

● MUSE (Micro Users in Schools and Education), PO Box 43, 231/2 Friary Chambers, Whitefriargate, Hull HU1 2HD. Tel: (0482) 20268. User group for teachers and parents. Please send sae.

● National Extension College, 18 Brooklands Avenue, Cambridge CB2 2HN.

● CET (Council for Education Technology), 3 Devonshire Street, London W1N 2BA. Please send sae.

● Software Limited configure CP/M programs for the BBC micro. Write for a catalogue to No 2 Alice Owen Technology Centre, 251 Goswell Road, London EC1N 7JQ. Tel: 01-833 1173.

USER RAM

● Our thanks to Sebastian Lazareno of Ware, for telling us how to make the 16k *Acorn User* UserRAM work with the popular APTL ROM board.

The solution is simple, just make (ie connect) link 6 on the APTL board. This switches the write-protect facility from slot 15 on the APTL board (used for RAM) to the rest of the sockets on the board. Ideally a switch should be included in the link to allow you to switch the write-protect on and off as required.

BLUNDERBOX

● A line managed to get cut out of the April edition of First Byte, the line in question is:

```
470 FOR pass=0 TO 3 STEP 3
```

Our sincere apologies to you and our thanks to Gordon Sheppard of London for pointing it out.

● Apologies for two bugs that crept into Tunemaker (March).

Lines 710 and 1230 should read:

```
710 IF notune% THEN PRINTT
AB(2,30)"NO TUNE IN MEMORY":
i%=INKEY(300):GOTO 750
1230 IF key$="C" OR key$="c
" THEN PRINTTAB(32,5);SPC(5)
:INPUTTAB(32,5),tempo%
```

● Thanks to Jon Thackray for pointing out the error in the Master review on page 75 of the March issue. When specifying a filing system as part of a filename, the filing system name should be enclosed by hyphens, eg:

```
100 LOAD "-DISC-PROGRAM"
```

● Sorry! Mike Rawlings' article Sideways Storage in March contained a number of errors.

In the third paragraph on page 85 we stated listing 2 was the Tube compatible version – it should have read listing 3. And the caption to listing 2 on yellow page 114 should have read: 'Listing 2. A program for use on a Solidisk board'.

On page 86, 10 lines from the bottom of the first column, the listing line numbers should have read 902 to 909 not 1100 to 1170. Alternative lines to adapt integer read/write routines to handle two byte or three byte variables were missed from the yellow pages and you'll find them here:

Listings 1 and 2 –two bytes
```
1240 !&90=t+n*2:?&92=bk:?&93=2:
!&94=v
1300 !&90=t+n*2:?&92=bk:?&93=2
1320 =!&94 AND &FFFF
```

Listings 1 and 2 – three bytes
```
1240 !&90=t+n*3:?&92=bk:?&93=3:
!&94=v
1300 !&90=t+n*3:?&92=bk:?&93=3
1320 =!&94 AND &FFFFFF
```

Listing 3 – two bytes
```
1930 !&255=t+n*2
1950 ?&258=2
2020 !&255=t+n*2
2040 ?&258=2
2060 =!&259 AND &FFFF
```

Listing 3 – three bytes
```
1930 !&255=t+n*3
1950 ?&258=3
2020 !&255=t+n*3
2040 ?&258=3
2060 =!&259 AND &FFFFFF
```

Listing 4 – two bytes
```
1930 !&255=t+n*2
1950 ?&258=2
2020 !&255=t+n*2
2040 ?&258=2
2060 =!&259 AND &FFFF
```

Listing 4 – three bytes
```
1930 !&250=t+n*3
1950 ?&258=3
2020 !&255=t+n*3
2040 ?&258=3
2060 =!&259 AND &FFFFFF
```

We thought it was about time we put you in the picture.

When we introduced our AMX Mouse to BBC Micro users, the response was phenomenal.

And no wonder!

It was regarded as 'pushing the BBC to its limits' and hailed by the press as 'probably the best input device that has appeared recently'. The AMX Mouse brought to BBC Micro users the same sophisticated, positive control that had, until then, been the province of the more expensive computers, like the Macintosh.

Now we announce a new enhanced software package which, can be used with a traditional keyboard or joystick but truly comes into its own when used with the AMX Mouse.

AMX Super ROM and Super Art adds colour to the features of the original AMX ROM, on a new 16K ROM.

It dramatically extends the original AMX ROM facilities to include Pull Down Menus, over lapping colour windows, colour patterns and an extended Icon set in all graphic modes.

Specially written to be usable with the vast majority of BBC Systems including 2nd processors, the Aries RAM Board, the BBC + Shadow mode, tape, DFS and ADFS.

The kernel of the Super Art program is included in the 16K ROM, providing tape and disc users with a Mode 1 colour drawing program.

But Super Art really comes into its own when used on a disc based system; a host of additional facilities can be selected direct from the screen.

Colour pictures can be created in dot resolution up to A4 size by scrolling the screen window, over the picture.

Other facilities include colour pattern editing – use of icons, additional text styles, various copy facilities and a superb colour Zoom.

Pictures can be printed out in colour (Integrex) or shades of black and grey on Epson compatible printers.

The results can be astonishing! – you can even store your finished 'masterpieces'.

The AMX Icon Designer facility gives you further freedom to design and store your own custom icons for use in your own programs.

This fabulous new package costs only £89.95 – a price as remarkable as the package itself – and includes a fully illustrated operating manual.

If, however, you are afraid of mice, you can purchase just the software package plus the 16K Super ROM for just £49.95.

You will still achieve some pretty remarkable results using your keyboard or joystick – not nearly as good as with the Mouse of course – but you can always add one later on for just £40.

Then you'll really be 'in the picture'.

AMX MOUSE

IMAGINATION AT YOUR FINGERTIPS.

Disc Interfaces and Wi...

The Solidisk Winchesters are now available for the BBC Model B, B Plus and the new Master Series machines. They are supplied with the Solidisk DFS+ADFS ROM set, available in two 16K or one 32K ROM.

WINCHESTER FOR SINGLE USERS

The Solidisk ADFS can handle one or two Winchester drives plus one or two floppy disc drives. Files on any drive can be up to the drive size in length. Up to 10 files can be open at the same time and unlimited numbers can be organised in a multi-level catalogue. Files can grow in place without risk of "Can't extend".

The ADFS allows the Winchester to be "partitioned" into multiple user areas, accessed by CP/M (Z80), Panos (32016) as well as 6502 ADFS. The Acorn Z80 Second Processor as supplied requires a new BIOS ROM to run CP/M.

WINCHESTERS FOR SMALL NETWORKS

Solidisk will soon introduce the NET-DISC Filing System (NDFS). This, although using the standard ECONET hardware, implements a direct link between any workstation and the Winchester disc drive on station 254. No dedicated file server machine (nor any Second Processor to run the File Server software) is needed.

The NDFS will also be suitable to network 32016 and Z80 Second Processors. The cost saving is substantial, especially for small networks. For example, four workstations sharing one Winchester via such a network is cheaper than four stand-alone machines equipped with local floppy disc drives.

WINCHESTERS FOR LEVEL 2 FILE SERVERS

The Solidisk Winchester Disc Filing System (WDFS) ROM enables the Acorn File Server (Level 2) to use the Winchester in place of floppy disc drives. This will improve both speed and capacity. The WDFS will work with either the 8271 or the 1770 Disc Interfaces.

HIGHER CAPACITY, RELIABILITY AND SPEED

The Winchester drives have much higher capacity than floppy discs, measured in Megabytes instead of Kilobytes. The disc is protected from dirt by a sealed casing, and has a much higher inherent reliability. The disc rotates continuously at high speed (3600rpm) enabling data to be transferred 20 times as fast as floppy discs.

HARDWARE REQUIREMENTS

To use a Solidisk Winchester, you will need a 1770 Disc Interface (Acorn or Solidisk). Master and BBC B Plus machines have this as standard. If your BBC B has no disc interface, we recommend the Solidisk 1770 Disc Interface. If you already have the 8271 Disc interface, we recommend the Solidisk 8271+1770 Disc Interface. The Winchester drive is connected to the 1MHz bus socket.

5.25 inch WINCHESTERS

These drives (10, 20 and 40 Megabytes formatted) are of established design, with low noise and power consumption and have the same "form factor" as a half-height floppy drive.

3.5 inch WINCHESTERS

These are of the latest technology, with even lower noise and power consumption in a smaller package, and have the same "form factor" as a 3.5 inch floppy drive.

BEEB-POWERED OR MAINS-POWERED

The Beeb-powered Winchesters are only suitable for use with machines fitted with the shiny, switched mode power supply and all Master series. The Winchester power lead will also support a floppy disc drive. In other cases, a mains-powered Winchester should be specified.

THE SOLIDISK WINCHESTER RANGE

Each Winchester drive comes with:

— Integral power and data leads.
— DFS (or WDFS on request) and ADFS ROM set.
— One utility diskette in 5.25 inch, 80-track double-sided ADFS format.
— Manuals covering the above hardware and software.
— One year guarantee.

The Solidisk Winchesters are available in the following packages:

	BEEB-POWERED	MAINS-POWERED
10 Megabytes 5.25 inch	£499.00	Not available
20 Megabytes 3.5 inch	£720.00	Not available
20 Megabytes 5.25 inch	£661.25	£747.50
40 Megabytes 5.25 inch	£1062.60	£1148.85
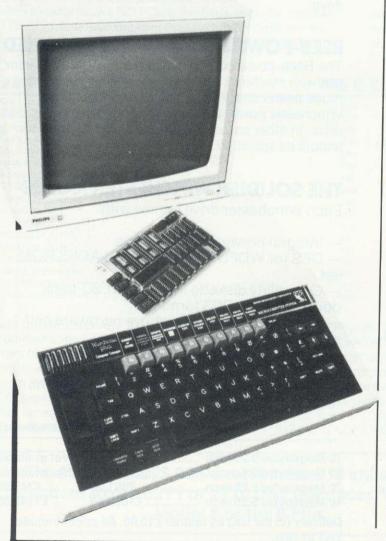
Delivery (in the UK) by courier £10.00. All prices include VAT at 15%.

SOLIDISK MEMORY UPGRADES

Solidisk memory upgrades for the BBC Model B offer excellent value for money. Their designs stand our for compatibility, speed, versatility and computing power. They use the latest component technology to achieve the lowest possible power consumption and size at low cost.

External ROM Cartridge

This comprises an adaptor which plugs into any ROM socket, and a blank cartridge which will accept one or two ROMs. These may be of 16K, 32K or 64K, depending on the capacity of the ROM socket holding the adaptor. This system is particularly useful for seldomly used ROMs, which are well protected by the cartridges. They can be installed and removed repeatedly without any risk to the ROMs and are compatible with Acorn cartridges.

Fourmeg CPU and ROM Expansion

The Fourmeg board plugs into the 6502 Processor socket, and two additional connections are made by sprung clips. It also provides one 64K and three 32K additional ROM sockets.

By adding faster memory and a 4MHz Processor, the board enables the BBC to run most programs in half the time. The new Processor is equivalent to that used on the Acorn TURBO board. It will run most Master software such as the new BASIC 4 and at twice the speed.

A switch selects between normal (2MHz) and fast (4MHz) speed. The higher speed is available to all ROMs and RAM installed in the Fourmeg board. The rest of the machine is unaffected.
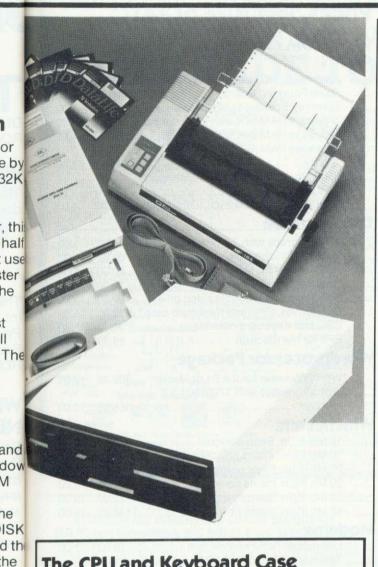
Fourmeg Board with 32K RAM

This comprises a Fourmeg board with 32K RAM and 16K MANAGER ROM. This extra RAM gives Shadow RAM and Sideways RAM capability. Shadow RAM supports the screen in any mode, leaving all the machine RAM free. Sideways RAM can contain the images of two Sideways ROMs or used as RAMDISK or printer buffer. Shadow and Sideways RAM, and the four additional ROM sockets can be switched to the fast 4MHz speed.

32K, 64K and 128K Sideways RAMS

These are the most popular add-ons for the BBC Model B. You can start with 32K and upgrade later to 64K, 128K (and even 256K). The 64K and 128K RAM boards have two 32K additional ROM sockets.

Solidisk Sideways RAM boards are compatible with most add-ons except ROM boards — which they replace. Sideways RAM can run almost all software that is normally available in ROM. Solidisk has a large library of application programs. These include Word-processor, Spelling Checker, Database, Spreadsheet, Extended Basic, Sprites, Ramdisc, Printed Buffer, Machine Code Monitor etc. and more than 70 computer games especially written for Sideways RAM. The programs are available in three packs, each of 5 discs, in 40 or 80-track formats. Pack 1 is included with all Sideways RAM board. Packs 2 and 3 cost £10.00 each (£1.00 p&p). Pack 3 consists entirely of games and game design tools.

The 256K Board

This has 256K of RAM, four ROM sockets, a 4MHz Processor, a 32K Manager ROM, together with WORDWISE PLUS — the best selling Wordprocessor from Computer Concepts.

The 256K RAM can be used as Shadow RAM, Sideways RAM and RAMDISK, or any combination of the three.

Real Time Clock and Solidesk

The Real Time Clock (RTC) is battery powered, giving accurate time and date. The "SOLIDESK" ROM uses the 50 bytes of battery backed RAM in the RTC chip to custom-configure the BBC computer on start-up — just like the new Master Machine. It also presents a friendly ICON/MOUSE environment — with calculator, memo and a number of disc operating system commands (DFS and ADFS). An AMX Mouse or a Marconi Tracker Ball is preferred as the input device, but the keyboard may also be used.

Floppy Disc Drives

Solidisk floppy disc drives are 80-track, double-sided, 5.25 inch, with a capacity of 640K in ADFS or Solidisk double density DFS. They are Beeb-powered, supplied cased, with power and data leads, and a software pack of 5 diskettes.

The CPU and Keyboard Case

This compact steel case can hold a BBC and two 5.25 inch half-height floppy disc drives. The keyboard is housed in a separate case connected by a 24 inch lead. With the monitor on top, it improves your viewing angle and leaves your desk uncluttered.

BBC Master in Stock,
Special Package Offers Available

1) 128K BBC Master,
   with Wordprocessing package £750

2) Business Pack: complete 3 operating 128K Master keyboards, Econet, 160cps printer, 20MB Winchester, 1 floppy drive, Wordprocessor, database, spreadsheet, all leads and manuals. Call for demo.
   Ideal for small offices £2399.00

All prices include VAT, delivery extra.

EXPLORE THE EXCITING WORLD OF COMPUTER GRAPHICS WITH THE UNIQUE LOW COST

GRAFPAD 2

The Ultimate in graphic input devices for the BBC microcomputer

Grafpad 2 is the first low-cost graphic tablet to expand the boundries of computer graphics for the home, business and educational user. The scope of this unique product is only limited by the imagination of the user. Create your own Games, Graphics, Illustrations, Pattern Designs, Plans, Circuit Diagrams etc. in high resolution colour. With full instructions, the Grafpad 2 is an extremely easy product to master.

- ● **Near A4 size drawing area**
- ● **High resolution colour**
- ● **Home, educational and business use**
- ● **Variety of optional programmes**
- ● **FREE ICON DRAWING SOFTWARE WITH EACH GRAFPAD 2**

£59.50

INC. VAT

Applications include:
- ● **Option Selection** ● **C.A.D.**
- ● **Form Input** ● **PCB Design**
- ● **Data Collection** ● **Education**
- ● **Picture Creation** ● **Picture retrieval** ● **Games**
- ● **Construction Design**
- ● **Logic Design**

Available from most Computer Dealers or direct from Grafsales Ltd.

GRAFPAD 2

HEGOTAOR ROBOTICS RH

SPECIFICATIONS

Resolution	Output rate	Origin
1280 × 1024 pixels	2000 co-ordinate pairs per second	Left-hand corner or selectable
Repeatability	**Interface**	**Dimensions**
1 pixel	Parallel	350 × 260 × 12mm

EPSON PRINTERS

EPSON LX-80 NLQ: A new low-cost high performance dot matrix printer from Epson. Its many features include Near Letter Quality, Draft mode, programmable characters, a variety of print styles, graphics etc. Supplied with friction feed as standard 100cps.

LX-80 **£195 (a)** Optional Tractor Feed **£20 (c)**

EPSON FX Range: This new range designed to meet virtually every type of computer based printing requirement, from correspondence quality (NLQ) text printing, a variety of fonts, to seven different levels of graphic printing. Fully IBM PC compatible with full graphics character set from the PC's keyboard. 8K built in buffer allows either data storage or creation of upto 240 characters of your own design. 160 cps for draft print and 32 cps for NLQ.

FX85 (80 col)..........**£315 (a)** FX105 (136 col).......**£449 (a)**

EPSON JX80 4 colour printer.................................. **£420 (a)**

EPSON LQ Range: This range with 24 pin dot matrix printers offers a high, 200 cps, draft speed and superb correspondence quality print at 67 cps and truly high resolution graphics and a variety of fonts.

LQ800 (80 col) **£595 (a)** LQ1500 (136 col) 2K buffer **£875 (a)**
32K buffer **£950 (a)**

TAXAN PRINTERS

A set of economically priced printers that offers full EPSON compatibility and the near letter quality option and a facility to install 8K additional ram or 8K eprom for custom font. Both friction and tractor feeds as standard. 140 cps draft and 24 cps NLQ. A variety of fonts and graphics in six densities.
KP810 (80 col)..... Reduced ......**£160 (a)** KP910 (156 col)..........**£339 (a)**

DAISY WHEEL PRINTERS

BROTHER HR15: * 14 cps * 3K Buffer * Two colour printing * Proportional spacing * Underline * Bold * Shadow print * Super/Sub script + many other features.

BROTHER HR15 **£285 (a)**

JUKI 6100: * 15 cps * 2K Buffer * Switchable 10/12/15 cpi * Proportional printing * Linear Motor for max reliability.

JUKI 6100 **£289 (a)**

Integrex Colour Printer **£569 (a)**
BBC Colour Screen Dump **£10 (d)**

DOTPRINT PLUS

The most versatile NLQ rom for the BBC Micro.
DOT PRINT PLUS not only gives you the 10 character pitch at 6 lines/in with underlined and double width characters as required but unlike all other NLQ roms, it offers a lot more.
* a built in CHARACTER FONT EDITOR enables disc users to create their own type faces for use in printing spooled text files.
* a built in View Printer Driver.
* MICROSPACING for professional justification in VIEW and — with discs — in WORDWISE/PLUS.
* true BOLD PRINT in addition to double width.
* 12 char pitch as standard — providing 96 CHARACTERS PER LINE on the FX/RX 80 for example.
* simple control codes allow VARIABLE PITCH LINE SPACING in 1/72" increments and VARIABLE PITCH from 12 cpi in increments of 1/240". (10 cpi can be selected by a single control code).
In short this one rom not only will provide professional NLQ facilities, but also a view printer driver and a font designer/editor for only **£28 (d)**

EPSON HI-80 PLOTTER

EPSON technology has once again scored a first by introducing a sophisticated A4 size plotter that does not need specialised software or programming skills to operate it and yet keep the cost within the reaches of all computer users. Features include 4 pens at a time — upto 10 colours to choose from, a variety of pen nibs, high speed plotting. Powerful software command codes include single commands to plot circles, ellipses or triangles. Line or bar graphs and pie charts can be plotted in a variety of exciting styles very simply by keying in the data into the computer.

Detailed leaflet on request.
Epson HI-80 Plotter £325 (a)

CENTRONICS GLP PRINTER

A NLQ printer at an affordable price. Fully compatible with Epson control codes offering a variety of fonts including super and subscripts, and a variety of graphic modes. Serial and parallel interfaces fitted as standard. Friction feed as standard. **£109 (b)** Tractor feed **£14 (d)**

PRINTER BUFFER & SHARERS

BUFFALO 32K Buffer for EPSON PRINTERS: This compact 32K buffer can be fitted internally on most EPSON printers within a few minutes. It does not require external power or any modification to the printer. It will hold about 15 A4 pages of text freeing your computer for other jobs in a fraction of the time it would normally have to wait for the printer to finish all that printing. Supplied with full fitting instructions.
Buffalo 32K Buffer **£75 (d)**

PRINTER SHARER/BUFFER: A unique sharer/buffer that provides a simple solution to improve system utilisation. It can be connected to up to three computers and it will automatically switch between the computers to scan for data — no manual switching required. High speed data input rate to the buffer cuts down the normal waiting time for the computers for the printing operation to complete and thus allowing the computers to be used for other uses. The 64K buffer would hold over 30 A4 pages of text.

Facilities include: COPY, PAUSE AND RESET. LED indication for percentage of memory available and data source. Mains powered. Send for detailed specification.

Available in 64K and 256K versions
TSB 64 **£199 (b)** TSB 256 **£275 (b)**
A Serial Buffer/Sharer will soon be available. Please send for details.

PERIPHERAL & COMPUTER SHARERS

An extended range of peripheral sharers to allow the user to switch between computers, printers and modems. High quality switching mechanisms housed in fully shielded metal cases ensure reliability. No external power input required.
All lines on the sharers are fully switched (36 on parallel and 25 on serial)

	Parallel	Serial
3 Computers to a Printer	36V36-3 £69 (c)	25V25-3 £64 (c)
4 Computers to a Printer	36V36-4 £85 (c)	25V25-4 £74 (c)
2 Computers/2 Printers x-over	36V36-X £69 (c)	25V25-X £69 (c)
BBC Cable Set 3 to 1 (1m ea.)	£32 (c)	£34 (c)
BBC Cable Set 4 to 1 (1m ea.)	£39 (c)	£41 (c)

Computer Sharer:
1 computer to 2 printers fitted with Cable for BBC TCS26 **£19.50 (c)**

PRINTER ACCESSORIES

EPSON ACCESSORIES:
Interfaces:

8143 RS232.................**£28 (d)**		8165 IEEE + Cable..........**£65 (d)**	
8148 RS232 + 2K............**£57 (d)**		8148 RS232 + 8K..............**£75 (d)**	
8132 Apple II...................**£60 (d)**		8177P NLQ for FX80 + /FX100 +...**£99 (d)**	

Parallel & Serial Buffers of various size also available.

FX80/80 + /85 Tractor Attachment..**£37 (c)**
FX80/80 + Paper Roll Holder..**£17 (c)**
LX80 Tractor Feed..**£20 (c)**

SHEET FEEDERS:

8338 LX80.....................**£49 (b)**		8331 FX80 + /85..............**£129 (b)**	
8333 FX100 + /105...........**£169 (a)**		8330 RX80 + ...**£129 (b)**	

Ribbons:

RX/FX80/80 +, FX85.........**£5 (d)**	RX/FX100/100 +, FX105....**£10 (d)**
LX80...............................**£4.50 (d)**	
H180 Pen Set (Aqueous/Ball point)................................**£7.50 (d)**	

Dust Covers:

FX80...............................**£5.50 (d)**	FX100..............................**£7.50 (d)**
TAXAN/Canon KP810........**£6 (d)**	KP910..............................**£7 (d)**

TAXAN CANON Accessories:

RS232 + 2K buffer............**£78 (d)**	Ribbon.............................**£6 (d)**

JUKI 6100

RS232 Interface.................**£65 (d)**	Spare Daisy Wheel.............**£14 (d)**
Tractor Feed.....................**£129 (a)**	Sheet Feeder....................**£182 (a)**
Ribbon (Carbon)............**£2.00 (d)**	

BROTHER HR15

Daisy Wheel......................**£18 (d)**	Sheet Feeder....................**£182 (d)**
Tractor Feed.....................**£90 (a)**	Keyboard.........................**£135 (a)**
Ribbon (Carbon/Nylon)...**£3.00 (d)**	

Printer Leads:

BBC Parallel Lead (1.2m).....**£6 (d)**	BBC Serial Lead (1.2m).........**£6 (d)**

Other lengths can be supplied on order.
IBM Parallel Lead (2m)..**£12 (d)**

PAPER & LABELS
Plain Fanfold paper with micro perforations:
2000 sheets 9½" × 11"..**£13 (b)**
2000 sheets 14½" × 11"...**£18.50 (£4.50)**

Labels/1000:
Single Row 3½" × 1 7/16"**£5.25 (d)** Triple Row 2 7/16" × 1 7/16".**£5 (d)**

NOVACAD
Computer Aided Draughting
for the BBC Micro

A sophisticated CAD package with unique facilities which until now were confined to custom built CAD packages.
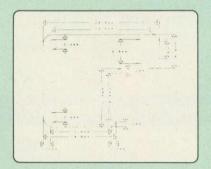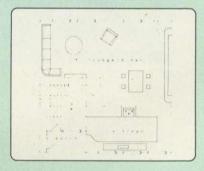
Whether you want to draw a complex electronic circuit diagram or plan your new kitchen or simply draw a cube NOVACAD will help you do it better and more easily.

All you need is a BBC micro model B fitted with Acorn DFs and a single disc drive. If you have a 6502 2nd processor and a dual disc drive NOVACAD's capabilities are further enhanced.

* Very user friendly with all commands and controls from the keyboard. Special windowing techniques make available to the user almost one million dots allowing a lot more detail to be put on the drawing than one would normally expect the BBC to be capable of. The drawing can be 4 windows across and 5 up.

* Libraries of user defined ICONS such as electronic symbols can be created easily and edited even in the middle of drawing another diagram. ICON size is not limited to a number of pixels. An ICON can contain up to 500 lines, so complete drawings or sections of large drawings can be saved as ICONS for use with other drawings.

* ICONS can be called by name from a library into any part of the diagram and can be moved, enlarged, reduced, rotated in 90° steps and have mirror images made before being finally positioned.

* Shapes can be copied on the screen as many times as required.

* The zoom facility allows the user to magnify any section of a drawing by up to 20 times to make it easier to insert details.

* Horizontal and vertical displacements can be measured in any user defined scale.

* Any two colour can be used in mode 4.

* Up to '8 levels' can be used to produce multi layer drawings, and then user can decide which levels are to be displayed. This can be particularly used in pcb drawings, architectural drawings with details of the services behind the walls displayed only when required and many other such applications.

* Text can be added at any position vertically or horizontally.

* Use of 2nd processor will allow use of any 4 colours, higher pixel density drawings and considerably faster operation. (NOVACAD without the 2nd processor is faster than any other CAD package we have seen for the BBC).

* Powerful delete facilities allow deletion of single lines or whole sections with minimum of key presses.

* Printer dump for Epson compatible printers incorporated in the software which allows a full or a sectional screen dump.

* An optional plotter utility contains a plotter configuration program allowing the user to configure a program for his plotter. Pre-configured programs are included for a number of popular plotters.

NOVACAD will prove to be an invaluable teaching aid in technical schools and colleges and for anyone involved in draughting it will be an ideal labour saving tool.

NOVACAD package with 16K ROM, Utility disc and a comprehensive manual £79 (c)

Novacd compatible with Tracker Ball/AMX Mouse £99 (c)

Stand Alone Mouse for use with NOVACAD £34 (d)

Upgrading of existing ROMs and DISCS £20 (d)

Plotter Utility Program £28.50 (d)

NEW META VERSION THREE

Now Available

* Assembles for even more processors
* Now over 70k long on 2 Roms and 2 Discs
* Dozens of new options, features and directives

The Original META system sold hundreds worldwide; it's being used in Universities, Polytechnics, British Telecom, the BBC, the MOD etc etc.

Now there's an even better version. It comes on two Roms and two Discs for your BBC or BBC + (Master soon) and gives you complete Editing and Assembly facilities for all the listed processors:

1802	68HC11	6808
HD 64180	68000	6301
Z80	8048 Series	6303
6502 (including *all*	8051 Series	6305
CMOS varients)	8080	6801
65C812	8085	6803
65C816	Z8	6805
6800	68120	6804
6802	68121	6809

META uses the appropriate standard mnemonics for each, eg. LD (HL) 0ABH in Z80 and MOVE. B DO, $S0 (A5, D6.L) in 68000 etc.

Full nestable Macro facilities are provided, and nestable conditional Assembly, (IF/ELSE/ENDIF), Modular source code (including parameter passing). True local and global labels, 32 bit labels and arithmatic (incl. MIL, DIV, AND, OR, XOR, SHL etc). 30 ways to send object code during Assembly, including Intel Hex, S.Record, Binary etc to Disc files, RS423, EPROM emulators etc, local reassembly and over 50 directives, including DS.X, DC.X, EQUX, FCB etc).

Incredible Wordwise-style Editor integrated in with Assembler; Search/Search-Replace, Block copy/delete, markers etc; dozens of special features and functions for Assembly code programmer. Fast and Friendly to use.

Plus special new serial Communicator Area with Complex Option page etc.

Send for your 8 page datasheet on the META Assembler and the PORTAL EPROM Emulators. Set of disassemblers and Logic Analyser coming soon.

£145 (c)

FIRMWARE AND SOFTWARE

DATABASE MANAGEMENT SYSTEMS

VIEWSTORE An exciting, powerful database with many features: Display can be 'spreadsheet' or 'card-layout' type. Powerful selection and sorting utilities. Any screen mode can be used. Data can be sent to View and ViewSheet. Maximum file size 4096MByte! Maximum record size 60K. **£39 (d)**

STARdataBASE A fast machine code, true random access database program in a 16K Eprom. Up to 4096 records in a file, up to 69 fields in a record. The record layout is totally user defined. Entirely menu driven — thus very user friendly. Extremely fast searches are possible using the Keysearch facility. Mailmerging from View and Wordwise, and address labelling. **£49 (d)**

MASTERFILE II The new version of the popular general purpose file management system allowing large amounts of information to be stored and processed. It allows up to 17 fields per record, and the only limitation as to the number of records is the capacity of the disc. This latest version features many new facilities including use with WORDWISE/VIEW **£17.00 (d)** Disc (80 or 40T).

GEMINI'S DATAGEM **£59 (c)**

WORD-PROCESSORS

VIEW Acorn's version V2.1 word processor rom. **£39 (c)**

VIEW VERSION V3.0 Also compatible with BBC + Complete with Printer Driver Generator. **£60 (c)**

HI VIEW Disc based version of VIEW word processor for use with the 6502 2nd processor. Allows 47K of user memory. **£36 (c)**

VIEW INDEX Disc based program to create an index from VIEW text files. Ideal for anyone concerned with writing extensive reports or books. **£10 (d)**

VIEW PRINTER DRIVER GENERATOR: This driver generator will enable you to produce a driver to suit your printer and also let you view the text as it will appear on the paper including condensed, italics, sub and super script modes. **£8 (d)**

VIEWSPELL: A rom based spelling checking utility with a dictionary of 70,000 words on disc. Additional/specialised dictionaries can be created. Facility to search the dictionary for words beginning with or ending with certain characters. **£52 (d)**

WORDWISE **£28 (d)**

WORDWISE PLUS The new advanced Wordwise on a 16K eprom, for the more specialised users who require added features and flexibility. Four new programs are also supplied allowing mail-merging, index generating, two-column text printout and continuous processing. **£45 (d)**

WORDEASE A rom based utility for the Wordwise plus. **£24.50 (d)**

SPELLCHECK III A 16K rom based program for View and Wordwise plus. Contains 2000 words on the rom and 6000 (expandable to 17000) on disc. **£31 (d)**

EDWORD II **£43 (a)**

SPREADSHEETS

VIEWSHEET Acorn's spreadsheet provides 255 columns and 255 rows and will operate in any mode. Windows can be created which can then be rearranged to provide any print format required. Function keys provide for easy entry of commands. Printer control codes can be used using the printer driver. Fully compatible with VIEW and the 6502 2nd Processor. **£39 (d)**

VIEWPLOT: A disc based Linear graph/barchart/piechart plotting program. **£25 (d)**

INTERSHEET The new spreadsheet from Computer Concepts. Many advanced facilities including 105 character display, several spreadsheets may be used at once, may be used with View & Wordwise etc. etc. **£45 (c)**

INTERCHART Graphics Package for the Intersheet. **£30 (d)**

ULTRACALC **£49 (d)**   **QUICKCALC** **£14.50 (d)**

LANGUAGES

META-ASSEMBLER: For full details please see page 6 of this advertisement.

Meta-Assembler £145 (c)

ACORN P-SYSTEM A portable operating system supplied complete with USCD PASCAL and FORTRAN 77. **£259 (b)**

6502 DEVELOPMENT PACKAGE A Macro-Assembler with utilities for use with the 6502 2nd Processor. Enables the serious programmer to develop large programs in assembly language. **£39 (d)**

ACORN MICRO-PROLOG: The logic programming language seen as the language for programming in the future and used extensively in the artificial intelligence field. A simple 'front end' is supplied to make syntax more user friendly for new users. 16K Rom, manual and extension modules. **£62 (c)**

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HINTS & TIPS

Martin Phillips offers a few tricks to help with debugging and a way to split long programs up into smaller, more manageable, pieces to try to overcome the Beeb and Electron's lack of memory

SQUASHING THE BUGS

I have come to realise that most programs do not work first time; indeed most programs don't work the second or third times either! Just sitting and staring at the program or the listing usually offers very little hope of solving the problem.

If it's a program you've written yourself, it is often the silly things that cause the most trouble; if it's a magazine listing then it is usually a typing mistake such as 'O' instead of a '0', or missing out a line or part of a line.

The usual way of solving the problem is trial and error – keep changing bits and pieces until something happens, or keep comparing the typed-in program with the printed listing, hoping to spot the difference. This often works, but there's far more satisfaction to be had by being able to predict the part of the program where the fault is likely to be, and trying to spot it.

One usually gets a better understanding of programming on the way, and it's a process which gets easier with time. I get comments from readers who say that they hate having to debug programs, yet those same people will spend hours playing adventure games.

Debugging programs can be just as much fun, and very satisfying – equally it can be just as annoying and frustrating! There are, though, a few tricks to make the debugging process much easier.

● Always save copies of the program regularly, so that if something happens to the version you're working on, you can load in the previous one and only a part of the work will have been lost.

I always save programs with filenames that give a version number, eg, SAVE"PROG05". This is also useful when you get into a mess with the changes made, as you can retrace your steps back as far as necessary. If you've a printer and an unlimited supply of paper (printers are rather effective machines for wasting paper), it's not a bad idea to save a print out when saving to disc, and mark each print out with the version number.

● You should always put the ON ERROR statements in as REM statements until the program works. That way you can get some idea of what is going wrong. Once the pro-gram runs, the REM can be removed and the ON ERROR restored.

● Similarly, always REM any *FX200 call which disables the Escape key and alters the function of the Break key.

● If it's not obvious where a program is going wrong, use the STOP command.

Insert the word STOP at a point where you are fairly certain the program will run to, and then run the program, moving the position of the STOP through the program line by line (or a few lines at a time) until you come across the offending line. I usually put STOP at an in-between line number so that it's easy to delete and move on.

When a program stops because of an error, it's easy to miss the actual error or the error line. All is not lost, though. Simply type REPORT to see the error message again, and type PRINT ERL to find the line number. If the result is 'at line 0' with no error given, then the program has well and truly crashed. An example of when this can happen is with Basic 1 and the INSTR function: when the search string is longer than the string being searched, the program crashes and this cryptic error message is given.

● If you know an error exists in a certain piece of code, and the problem is a stubborn one, then define a function key to list that part of the code on the screen. For example if the fault in the code lies between lines 180 and 270 then program function key 0 as follows:

`*KEY0 MODE7 |M |N LIST 180, 270 |M`

(Or MODE6 for the Electron.)

This idea is especially useful when the function of the editing keys has been changed by *FX4 or the auto-repeat has been switched off. Another key (or the same one) can have the extra code:

`*KEY1 *FX4,0 |M *FX12,0 |M`

*FX4,0 sets the editing and cursor keys back to their normal editing functions, and *FX12,0 puts the key auto-repeat and delay back to its normal setting.

Using the function keys in this way can save a lot of typing (and therefore possible mistakes) and makes debugging much easier.

● A common error is 'No such variable'. Instead of having a vague look at the offending line of code, try to run the program. List the line and print out all the variables to find which one does not exist. This is very easy to do. An example program line of:

`230 FOR J = start TO end STEP N`

has three variables which need to be pre-defined: 'start', 'end' and 'N'. Therefore type:

```
PRINT start
PRINT end
PRINT N
```

and with luck the problem will now show itself. It's then a task of checking back through the program to find where that variable should have been defined. A common fault is a spelling mistake in the variable name, or capital letters where lower case should have been used. Sometimes all the variables give a value and you're almost back to square one, but now the fault is easier to spot – obviously one of the variables is not what it seems on the screen. Look at the following line.

`230 FOR J = start TO endSTEP N`

Here a space has been missed out, and the dreaded 'No such variable' message appears because the computer thinks that 'endSTEP' is a variable.

This technique is valuable with arrays, where things such as subscript errors can be very tricky to spot, and being able to print out what's stored in a particular array can be enlightening. A peculiar quirk of BBC Basic is that an element of an array can be printed in the same way as a normal variable after the program has run, but only if the program has not been edited.

As soon as a line of text is altered, the pointers for the array are lost and the elements cannot be printed out.

● If you have tracked a difficult problem down to a procedure in the middle of the program, and it takes ages to run the program to that point, then save the program, delete everything but the procedure and write a short dummy program call it up with the correct variables. I find this a useful technique when writing programs as I can test a possibly problematic procedure before putting it into the program. Several examples of this technique have appeared in Hints & Tips, where I present a listing with a short sample program to show how it runs – listing 1 and 2 on the yellow pages are good examples.

● When editing listings that have no space between the line number and the actual listing, it's a good idea to use LISTO 1.

● The error message routines in BBC Basic are not too bright, and they are easily fooled. Either the error message itself can be incorrect,

or the line number given can be different from the line where the error actually is.

        PRINTTAB(3,4) "HELLO"

will print "HELLO" near the top of the screen, but if the TAB statement is missed out:

        PRINT (3,4) "HELLO"

the error message 'Missing)' is given – obviously incorrect as it's the statement TAB that's missing. When this error occurs, count the number of right and left brackets in the line – they must be equal.

It is possible to have an error line different from where the error occurred; ie, the OSCLI routine needed by Basic 1 users:

        10 DIM A 50
        20 X% = A MOD 256
        30 Y% = A DIV 256
        40 $A = "HELP"
        50 CALL &FFF7

When run this lists all the ROMs in the machine – it's the same as typing *HELP, except it's been called from within a program. If a mistake is made in line 40 thus:

        40 $A = "HELPP"

then an error message is given, not at line 40, but at line 50. In this example it is easy to find the problem, but when the OSCLI routine is a procedure called from several points in the program, finding the error can take some time. A common example occurs with the READ and DATA statements. The following program reads five numbers, stores them in an array and also prints them on the screen.

        10 DIM A(5)
        20 FOR N% = 1 TO 5
        30 READ A(N%)
        40 PRINT A(N%)
        50 NEXT
        60 :
        70 DATA 1,2,3,4,5

However, if a mistake is made in the DATA statement, for example:

        70 DATA ,1,2,3,4,5

the error message says:

        No such variable at line 30

● Errors are often very difficult to spot when they are in long multi-statement lines. The solution here is to split these lines up so each statement is on a different line, for example:

        10 DIM A(5):FOR N% = 1 TO 5:READ A(N%):NEXT
        20 . . .

can be split up to become:

        10 DIM A(5)
        11 FOR N% = 1 TO 5
        12 READ A(N%)
        13 NEXT
        20 . . .

This is where it helps to have program lines numbered in tens.

PROGRAMS IN PIECES

A limitation of the BBC micro and Electron is the lack of memory when using graphics. In modes 0, 1 and 2 there is less than 5k when using discs. This has been overcome to some extent with the Master and BBC B+ with shadow modes, but can still cause many difficulties. However, careful program design can often overcome this limitation, and even have several advantages. For instance, imagine writing a program on a 512k machine and having perhaps 100k of program to type in from a listing and then debug!

By now most readers will be familiar with the idea of procedures, and how they are able to break a program up into manageable chunks so that each can perform a specific function. This makes understanding the program much easier, and enables problem areas to be pinpointed quickly and errors cured.

There is a technique whereby some procedures can be stored on disc and pulled into the program as and when required, but this needs very careful planning, and can be quite difficult to debug.

A simpler approach is to divide a long program which uses graphics into several shorter programs, if possible, so it's even easier to follow and sort out any difficulties. A simple example is in the use of instructions, which can be given in a separate program which loads in first. There are other not so obvious advantages to this approach: for instance, BBC Basic does not do much 'garbage' collection so that in a long program a lot of memory can be taken up with spaces reserved for variables, strings and arrays that are no longer required but which the computer does not clear out. Then if memory is tight, after the program has run for a bit it crashes with the dreaded 'No room' error message. However, if the program is broken up, with new programs being

```
  10 REM Hints & Tips - listing 1
  20 REM by Martin Phillips
  30 REM for BBC B/B+/M/E
  40 REM (c) Acorn User May 1986
  50 :
  60 MODE 6
  70 PROCinit
  80 PROCstore
  90 CLS
 100 PRINTTAB(10,10)"Press space to loa
d"
 110 PRINTTAB(13,11)"next program"
 120 REPEAT:UNTIL GET=32
 130 CHAIN"H+T2"
 140 :
 150 DEF PROCinit
 160 DIM A$(5),B(5)
 170 C%=&3000
 180 A$(1)="This is the first line of t
ext"
 190 A$(2)="This is the second line of
text"
 200 A$(3)="This is the third line of t
ext"
 210 A$(4)="This is the fourth line of
text"
 220 A$(5)="This is the fifth line of t
ext"
 230 B(1)=1001
 240 B(2)=2002
 250 B(3)=3003
 260 B(4)=4004
 270 B(5)=5005
 280 ENDPROC
 290 :
 300 DEF PROCstore
 310 FOR N%=1 TO 5
 320 $C%=A$(N%):C%=C%+1+LEN(A$(N%))
 330 !C%=B(N%):C%=C%+4
 340 NEXT N%
 350 ENDPROC
```

Listing 1. Defines five strings and stores them . . .

Here are the strings:

This is the first line of text
This is the second line of text
This is the third line of text
This is the fourth line of text
This is the fifth line of text

Here are the variables:

     1001
     2002
     3003
     4004
     5005
>

The strings stored by listing 1 are printed out by the chained listing 2

CHAINed in as required, all this space is cleared out when the new program is CHAINed. Also, as there will be fewer variables, strings and arrays in a short program, there will be less of a problem with garbage collection anyway.

Splitting up programs into smaller programs can create problems, though. The main one is, how does one transfer data from one program to the next? If there are just a few variables, this is easy. The resident integer variables A% to Z% are not cleared when a new program is loaded, so 26 integer variables can easily be passed to subsequent programs. How can one pass strings and even arrays? Here is a technique which is very simple to operate and can be made to work in a wide variety of situations. All it does is to store integer variables, strings or arrays in 'safe' memory areas, so the next program can use the reverse process to 'load' them in again.

Listing 1 (opposite) is the program to define five strings and store them, together with five integer numbers, into memory locations starting at &3000. Listing 2 then retrieves the strings and numbers and prints them out. When trying this out, do remember to save each program first.

A string can be placed into memory by using the $ indirection operator, so $C% will place a string into memory starting at the memory location given by C%. It will also place a return character (&0D) after the string to indicate its end, which needs to be taken into account when incrementing C%. !C% will store an integer variable into four memory bytes starting at the location given by C%.

Listing 2 must be saved as H+T2 for the first program to be able to CHAIN it in. When it has loaded and displayed the variables and strings, try pressing CTRL-Break and then type OLD followed by RUN. The data should still be there, making it a very useful technique.

Perhaps the hardest thing is to find a 'safe' area of memory. This can be any part of memory which will not be overwritten by the program, or by the screen memory area, or by any memory area used by the computer itself. It is often advisable to avoid the first two bytes of a new page of memory if it is below PAGE, as the operating system often puts markers at the start of a page, eg, PAGE&900 (locations &900 to &9FF) are the RS423, sound and speech workspace. Often these are not used, so that this memory area can be used. The operating system puts a marker (in this case &10) at location &900, so to avoid any problems, it is best to start storing at location &902. Thus when Break is pressed, the first byte or two of data will not be corrupted.

```
10 REM Hints & Tips - listing 2
20 REM by Martin Phillips
30 REM for BBC B/B+/M/E
40 REM (c) Acorn User May 1986
50 :
60 PROCinit
70 PROCretrieve
80 PROCprint
90 END
100 :
110 DEF PROCinit
120 DIM A$(5),B(5)
130 C%=&3000
140 ENDPROC
150 :
160 DEF PROCretrieve
170 FOR N%=1 TO 5
180 A$(N%)=$C%:C%=C%+1+LEN(A$(N%))
190 B(N%)=!C%:C%=C%+4
200 NEXT N%
210 ENDPROC
220 :
230 DEF PROCprint
240 CLS
250 PRINT''"Here are the strings:"'
260 FOR N%=1 TO 5
270 PRINT A$(N%)
280 NEXT N%
290 PRINT''"Here are the variables:"'
300 FOR N%=1 TO 5
310 PRINT B(N%)
320 NEXT N%
330 ENDPROC
```

. . . to be retrieved and printed out by listing 2

FOR MASTERS

For those who've bought a BBC Master, and put a function keystrip into the new holder only to find that you cannot get it out again, try sticking a write-protect sticker on the keystrip to make a small tab – it can then be removed easily.

While on the subject of write-protect stickers, here is a tip for those who are also interested in car maintenance. If you have a timing light but it is not bright enough to show the markings on the flywheel, cut a notch in a silver write-protect sticker and stick that in the right place on the flywheel. This then reflects the light so that the timing can be set, the notch indicating the correct timing point.

When making a backup of a disc, always make sure that the disc to be copied has a write-protect sticker on it.

Vertical print is simple with the use of text windows. This program gives an example:

```
10 CLS
20 VDU28,20,16,20,5
30 PRINT "Acorn User"
40 VDU26
```

Notice that the left-hand and right-hand co-ordinate of the windows are the same value. Try leaving off the VDU26 (restore default window) to see why line 40 is necessary.

QUICKFIRE QUESTIONS

Darren White from Chelmsford would like to know how to disable any ROMs in his machine. First find out the ROM number (see Hints & Tips February '86) and then add this to the number &2A1. So, if the ROM in socket three is to be disabled, type ?&2A4=0. When this has been done, pressing Break will reset it, so if a disc auto-boot program is to be loaded, type either: *EXEC !BOOT or *RUN !BOOT. Depending on the type of !BOOT file, this is exactly the same as using Shift-Break, except that the computer is not reset first. If it's possible to catalogue the disc, at the top right it will tell you whether to *EXEC (option 3) or *RUN (option 2) the disc.

Mr Grimason from Portadown would like to know if his *Wordwise Plus* is faulty because it will not display more than two or three pages in the 80 column preview mode. This is quite normal: *Wordwise Plus* reverts to 40 column preview mode if there is not enough memory space left to go into 80 column mode.

Mrs Chesterfield from Bristol wants to know how to calculate how many data files can be stored in memory and on disc.

First the number of bytes in each record needs to be calculated.

To do this add one to the number of bytes allocated to each field in the record and then add these lengths together.

To find out how much memory is available in the computer to store a complete record, you will first need to run your database program so that it sets all its own workspace. Then leave from the program by pressing the Escape key and enter:

DIM P% −1
PRINT HIMEM−P%

The figure printed will be the amount of 'free' memory remaining. All you need do is divide the number of bytes required for each full record into this to give you the total number of records.

On disc the maximum storage space (assuming a newly formatted blank disc) is:

(number of sectors-2)*256

On a 40 track disc this gives 97,280 bytes and on an 80 track disc 199,680 bytes. Again, dividing the record length into this will give the maximum number of records.

If you need to have other programs co-resident on the disc you'll have to subtract the file length of each from the bytes free value before dividing this by the record length.

FIRST BYTE

TRANSFERRING YOUR AFFECTIONS

First Byte offers advice on the best way to transfer your programs from tape to disc

Tessie Revivis

In the early days with my computer, my big ambition was to get the cash together to buy a disc drive. This was about four or five years ago and my first disc drive was a single sided 40 track affair, which (I think) cost about £300! Nowadays such drives can be picked up at a fraction of the cost – less than £50 in most cases, while an 80 track drive can be yours for around only £80 (or about £150 for a Plus 3 for the Electron).

I don't propose to spend this month's First Byte chatting about disc drives but about the problem that confronts all users (other than lucky Master owners!) who upgrade from tape to disc – the subject of transferring your programs and games. If you are looking for information on disc drives I would direct you to two articles by Bruce Smith in the July 1985 and February 1986 issues of *Acorn User*.

When confronted with a problem of this type it's a good idea to break it down first into the steps you need to achieve, and then develop these into a program. The steps required for the tape to disc program are: 1) select tape filing system; 2) load program; 3) select disc filing system; and 4) save program to disc.

Overwriting software

The first problem you come across is that if you write a program to do the above, loading a subsequent program from tape will overwrite your transfer software! You can get around this, though, by using a function key to hold the instructions. For example, if we have a tape file called GRAPHICS, the program steps that would be required are:

```
*TAPE
LOAD "GRAPHICS"
*DISC
SAVE "GRAPHIC"
```

We've had to shorten GRAPHICS to GRAPHIC because disc filing systems will allow only seven characters in a filename. The key definition therefore becomes:

```
*KEY0 *TAPE¦ MLOAD"GRAPHICS"¦
M*DISC¦MSAVE "GRAPHIC"¦M
```

Pressing function key f0 at any time will therefore effect the transfer.

The above method works happily with straightforward Basic programs, but it won't work with machine code programs or data files or text files from a wordprocessor, for example. These can be transferred but you have to use the operating system equivalents of LOAD and SAVE; that is, *LOAD and *SAVE. Both of these star commands need information other than just the filename – they need to know the start and end addresses of the file in memory. To find this out, first catalogue the program with the tape system's extended catalogue information facility enabled. To do this type *OPT 1,2 after which the file can be catalogued. If our example file GRAPHICS was a data or machine code file on tape, the procedure would be:

```
*OPT 1,2
*CAT GRAPHICS
```

When the last block in the program has been reached the extended information will be displayed – it might look like this:

```
GRAPHICS 01 0200 00002000 00002000
```

The information presented here, in order, is:

GRAPHICS	—	the filename
01	—	the block number
0200	—	the file length
00002000	—	the *LOAD address
00002000	—	the execution address

The filename is obvious. The block number tells you the number of blocks used to save the program, a block being 256 bytes long (if you listen to a computer tape it's the noisy bit!).

Hex values

The file length is a hexadecimal value and leading zeros can be ignored, so the length of this file is &200 bytes. This value, combined with the file load address (&2000) is what is needed to transfer a simple data or text file from tape to disc.

To transfer this file we need to first *LOAD the file ignoring leading zeros to the specified load address – &2000 in this case – and then

*SAVE the file by specifying the start address (as given above) and the end address. To calculate the end address we simply add the file length to the start address:

```
&2000 + &200 = &2200
```

The format of the *LOAD and *SAVE commands is:

```
*LOAD "Name" LLLL
*SAVE "Name" LLLL EEEE
```

where LLLL is the hexadecimal load address and SSSS the end address, also in hex.

Using the format described above, the transfer sequence becomes:

```
*TAPE
*LOAD "GRAPHICS" 2000
*DISC
*SAVE "GRAPHIC" 2000 2200
```

As before, this can be put into a function key if so desired.

Machine code programs can be loaded in from tape in exactly the same way, but before they can be saved we have to know their run or execution address, which is the last value specified in the extended information. In the above instance it was &2000, the same as the load address, but this may not always be the case. The specification for a *SAVE of a machine code program is:

```
*SAVE "Name" LLLL EEEE RRRR
```

where RRRR is the run address. If GRAPHICS was a machine code program the 'save' line would need to be amended to:

```
*SAVE GRAPHIC 2000 2200 2000
```

The above 'star' method is fine, as long as the load address for the program is not less than &1900 (&1D00 for the Advanced Disc Filing System [ADFS]). If it is lower, problems can occur when trying to transfer it because the value of PAGE is at least &1900 when a disc filing system (DFS) or ADFS is installed. On a tape-based system PAGE is set to &E00. The DFS therefore claims at least 2.75k of memory in which it can perform its functions. Loading a program into this area of disc workspace can result in the corruption of the program before you save it. In the case of ADFS you will

probably not even be able to save the program in any form at all as it will corrupt the disc catalogue which the ADFS stores in this area of memory.

Saving the data

In cases such as these you can load the data or machine code into a 'foreign' area of memory and then save it as though it was saved from its expected address.

As an example, suppose a tape-based program called DUMP gave the following extended catalogue message:

DUMP 03 0300 00000F05

Here we have a file &300 bytes long, with a load address of &F00 and an execution address of &F05.

To load this file at a new address, proceed as usual but use a new load address (&2000 for example) thus:

*TAPE

*LOAD DUMP 2000

The *SAVE command can have a fourth and final parameter added to it – the relocation address – and it's this which is used to fool the DFS into adding the correct loading address to it. The format of the command in full is:

*SAVE "Name" SSSS EEEE RRRR AAAA

where AAAA is the actual load address. To complete the transfer the following two lines are required:

*DISC

*SAVE "DUMP" 2000 2300 0F05 0F00

The above raises the question of how we get the program to load and run below the DFS value of PAGE: more on this in a moment.

The approach detailed so far for loading and saving programs, data and machine code files is effective, but if there are a large number of files to be transferred, tedious. Listing 1 on the yellow pages is an automatic program which will do the lot for you – all you need do is run the program, making sure that the tape containing the programs to be transferred is in the cassette recorder and a blank formatted disc is in drive 0. The program is intelligent and copies all types of files.

Once you have your programs on disc you can, in most instances, simply load them in and use them as normal. There are times though, when perhaps because of the program's size, it will only run as though it is a tape-based program with PAGE set to &E00.

Such programs can still be used but you need to employ a routine to relocate the program. In simple terms you need to load the program in from disc; select the tape filing system; move the program down to &E00; and then run it.

Basically what's required is a short routine which takes the bytes of memory from PAGE to TOP (the top of your program) and puts (or pokes) them into memory starting at &E00, and ends by resetting PAGE to &E00 and running the program. Listing 2 on the yellow pages can be added to the end of your program to perform the task.

After you've loaded your program in from disc, type:

GOTO 10000

and the program will be relocated and run.

Machine code programs can be treated in exactly the same way, but PAGE and TOP should be replaced by the load and end address of the file, and the RUN by a CALL to the execution address, ie, CALL &F05 in the case of the DUMP program described earlier.

Protected files

All that I've described so far will work happily provided the software you are tyring to transfer is not protected in any way. Protection is, in many cases, ingenious programming by the software writer that will not allow you to make extra copies of the program. If you can't catalogue the program or get it to produce extended messages, the program is almost certainly protected.

Programs of this type can still be transferred but need transfer routines which are too sophisticated to be described here or, due to their length, listed in *Acorn User*. However, there are many ROMs available that will transfer programs from tape to disc for you.

Watford Electronics, for example, sell *Transferom*. This will cope with most (though not all) protected programs including very long adventure programs. It is menu driven which means that it provides you with options which you select by pressing a particular key. *Transferom* is for the BBC micro.

Slogger Software markets *T2P3* (a Tape to Plus 3 transfer ROM) for the Electron which is easy to use, though you'll need a ROM expansion box into which to insert the ROM.

Replay is the current state-of-the-art answer to tape to disc transfer, available for the BBC B. This consists of a ROM and some hardware which must be attached inside the computer. Once installed it will cope with virtually any program you care to put to the test.

To sum up, transferring your own programs from tape to disc is straightforward and listing 1 will cope well. Commercial software is generally protected to prevent copying and in such instances you'll need a ROM to perform the task for you.

How to enter and use the program

The T2D (Tape 2 Disc) program is written entirely in Basic and should present you with no real problems when entering it. When it is complete you should save it to disc using the filename 'T2D'.

To test the program take a blank tape and save about half a dozen programs onto it, one after the other (you could use the T2D program and save it six times using a different filename each time). When you have done this put a blank formatted disc into drive 0 – in fact you can use a disc containing files as long as there is enough room to take the files from the tape. Load and run the T2D program, and follow the instructions presented on the screen. After you press any key the first program will load from tape. The tape will then stop and the program will be saved to disc. This process will repeat until all files on the tape have been loaded in and saved to disc.

The program cannot tell when all the files have been transferred. Once you are sure that they have been, or the tape has wound through to its end, press the Escape key. Type *DISC followed by *CAT. You should see the six files in place and these can now be loaded in and used in the normal way.

The program relies on the cassette recorder having a motor control on it so it can be turned on and off while programs are being transferred. If your cassette player does not have this facility, you'll need to do one of two things. First, to stop the tape after each program has been loaded in, or second, to leave a few seconds gap on the tape between each file as you save it. In practice, however, you will probably not need to do either as the transfer will be so quick the tape will not have reached the next program when T2D comes to load it in.

If you have a double sided or dual drives you can adapt the program to save on to whichever disc surface you want, simply by adding an extra line:

315 *DRIVE 2

Insert the drive number to suit yourself. The above would save the file on drive 2.

PRODUCT DETAILS

Transferom – £25.30
Watford Electronics, Jessa House, 250 Lower High Street, Watford, Herts. Tel: (0923) 37774.
T2P3 – £19.95
Slogger Software, 215 Beacon Road, Chatham, Kent. Tel: (0634) 52303
Replay – £35.00
Vine Micros, Marshborough, Sandwich, Kent. Tel: (0304) 812276

See yellow page 105 for Tessie Revivis' T2D program listing

LETTERS

MASTERING THE ELECTRON

Sir, Congratulations to Acorn on the latest computer, the BBC Master – it's now by far the best on the market. I especially like the ROM facilities, pinched from the Electron's Plus 1 unit.

I'm an Electron owner and although I like the Master very much I will probably stick with my machine for a while.

Which brings me to the point of this letter. It is my experience (humble though it may be) that tape and disc drives are a pain in the backside and that permanent memory RAM units are the solution to the problem.

If the boys at Acorn could upgrade the Electron's Plus 3 unit, replacing the discs with a solid state permanent memory filing system and include with it a numeric key pad, it would please me no end.

G C Warren
Surrey

LEGAL AND DECENT?

Sir, I have recently come across a situation that is probably very familiar to those readers of *Acorn User* who have tried to obtain equipment from mail order companies, but I have seen little comment on this subject in the correspondence columns of any of the popular home computer magazines. I refer to the highly misleading advertisements that regularly appear from many large and famous companies offering equipment that they do not carry in stock, have not had in stock for some time, and whose true prices bear little or no relation to the figures quoted in the published advertisements.

A recent attempt to buy disc drives gave plenty of examples of

this dubious practice. A well-known company received my order, but I heard nothing for two months, in spite of writing again. Eventually, I phoned them, only to hear they had not had the item in stock for the whole period in question and wouldn't be getting them for another month. Meanwhile adverts, with steadily rising but entirely fictitious prices, regularly appeared in the press. The likely price applicable when they would have stock to send out would be some £50 more than that published when I had originally ordered.

I then telephoned every company in the February issue of *Acorn User* claiming to sell this particular item. Most did not have the disc drive, and those which did were selling at prices substantially above those advertised.

This occurred so consistently that it was hard not to believe that the microcomputer business has adopted the practice of placing ads of goods they know they cannot provide, at prices they have no intention of honouring.

Another example was Gemini's *Datagem*, offered by two companies at big discounts. One company has advertised this price regularly, in spite of having no stocks of the item. The other 'sold out' of the reduced price stock while the ad was still current.

I think we can all accept price rises, selling out of stock and similar events. However, the habit of advertising 'fantasy' goods at 'fantasy' prices seems more a cynical manipulation of the customer. Presumably the companies benefit, though I rapidly saw the advantages of going to a High Street

dealer. Does the home computer trade really need to work like this?

Dr G P Harper
Essex

There have been a spate of complaints about disc drives, and the Advertising Standards Authority investigated Akhter, Microman, Tiger, Twillstar, Viglen and Watford. In each case the company was judged to have been caught by an unexpected price rise and, because it had acted in good faith, the complaints were not persued. Vigilance is vital and the motto is to check before ordering.

ART INTO SUPER ART

Sir, May I point out a small inaccuracy in Jonathan Inglis' review of the AMX *Super Art* package in the March edition of *Acorn User*. He expressed disappointment in being unable to load pictures previously created with the old *Art* programs.

It is perfectly possible to load old screens into *Super Art* – you simply have to select option LOAD B&W (black and white) from the Goodies menu and then supply a filename.

The picture can then be saved in *Super Art* format by selecting option CREATE from the file menu. The picture in figure 1, for example, is one of several that I have successfully transferred.

Keep up the good work (*Acorn User* and *AMS*!).

Chris Parker
Peterborough

FLIGHT KNOWLEDGE

Sir, I am extremely interested in flight simulation programs. I have all the programs available that I have knowledge of, but I'm sure there are more.

I am looking for someone to help in designing a definitive flight simulation program. Through my knowledge of real flying, general interest in aviation and seeing the good and bad parts of the many flight programs that are around at the moment, I feel that I am in the position to be able to offer the basis for a very realistic package indeed.

I have no knowledge of programming the BBC B but of course I have basic knowledge of the machine's operation.

I would be very pleased to hear from any individuals, companies or software houses who have a flight simulation program which is not generally available or from any party interested in my idea. I really would like to get this 'off the ground'!

Alex J M Ford
Western Engineering,
27 Colne Avenue, West Drayton,
Middlesex UB7 7AJ

ALONE IN OZ

Sir, A lonesome BBC owner would like someone in Australia, preferably in Sydney, to write to, to swap games, ideas, etc.

Also anyone in a user group in Sydney who would like another person to join could ring me or write a letter.

I will send a reply to every letter as quickly as I can. Please write to me at 9 Cudal Place, Carlingford, Sydney 2118, Australia. Tel: 8722534.

Matthew Weir
Sydney, Australia

Figure 1. A car successfully driven from *Art* into *Super Art*

LETTERS

128k B+ SHADOW

Sir, When February's issue of *Acorn User* arrived I was very interested to read Joe Telford's article on shadow RAM, having bought a 128k BBC B+ with *View 3* three weeks earlier.

On the other hand I was somewhat amazed to see the news about the new Master series of machines. I think Acorn has a cheek to run two page adverts for the 128k B+ one month and then announce its successor the next!

I am very pleased with my new machine but would have hung on and saved myself the cost of *View* if I had known about the Master – or for only a tenner or so more I could have had an on-board second processor.

Anyway, could you please ask Mr Telford if he would write about uses for the 12k of sideways RAM above the screen RAM on the B+ – is there any way to use it as a printer buffer, for instance?

Meanwhile, I console myself with the thought that the 128k B+ is probably more software-compatible than the Master series; at least one can still transparently load soft-key definitions, etc, in the usual way.

PS: Has Acorn been taking lessons from Amstrad?

Paul F Tolson
West Yorkshire

WHY NO SUPPORT FOR THE 6502?

Sir, I am writing to explain my frustration at Acorn's range of product. At great expense (since I was still at school) I bought a BBC B three years ago. Unlike many others, I am a serious programmer and was disgusted by the Beeb's low memory capacity. The 6502 second processor was therefore the next logical purchase. The support for this product from Acorn was, and still is, abysmal. Also, unlike decent machines, no

monitor or drives were included with the BBC B.

Thank goodness I didn't upgrade to a B+ – an obvious stopgap to keep Acorn afloat. And now the new Master Range. Congratulations Acorn – it looks like a winner! It also looks as though a death warrant has been signed for the model B.

From constant use, my second processor now refuses to work, and I have the equivalent of an elephant on my desk (my Beeb and its peripherals).

Like many other Beeb owners I feel cheated and disgusted at the lack of support for the 6502 second processor. I am now studying for a Computer Studies degree, with the aim of becoming a systems analyst. So goodbye Acorn – my next machine will not be a revamped fossil. It will be a genuine 32 bit, drive and monitor inclusive, machine for the 1990s. I have learnt by my mistakes.

I S Gibson
Kent

PRODUCING STRIPS

Sir, Wanting to make a new function key strip for a program I was writing recently, I turned to Computer Concepts' *InterSheet*.

The technique proved to be simplicity itself. Columns A and L of the sheet are set to three characters wide, and columns B to K (10 columns, corresponding to the 10 function keys) are each set to nine characters. The labels needed are then typed into the 10 columns, using centred justification. By using the 105 column display mode, the whole key strip can be seen at one go, and the layout is thus easily checked.

Finally, the print command /P 27,64,27,77; is entered, which sets the printer (Epson or Canon) into elite-sized characters. Columns A to L are then printed, and hey-presto: the key strip is produced.

David N Waters
Bucks

This lady was produced by Graham Owen – can you help him create better?

HELP ON GRAPHICS

Sir, I am a research student at Manchester Polytechnic, my interest being in computer graphics.

Could I through your letters page ask for a little assistance? I would like to hear from any reader who's into computer drawing of any kind. I am interested in any drawing programs or pictures for any purpose whether purely artistic, graphic or technical.

The work could have been carried out on a commercial package and be black and white or colour, then dumped to plotter or printer. I would also be interested in software designed by individuals, or any recommendations readers might make about any particularly useful programs or utilities.

To finish on a high note: I very much like the new magazine design and layout, and the high standard of editorial content. It appeals to a wide readership, and also to the continuing newcomers to computing (no, I'm not crawling!).

Graham Owen
M A Studies, Department of Communication Arts and Design, Grosvenor Building, Cavendish Street, Manchester M15 6BR

Two addresses which may be of help are those of SIGGRAPH UK, 129 Ardmore Lane, Buckhurst Hill, Essex IG9 5SB

and ACADE, c/o Hugh Anderson, Faculty of Art & Design, Middlesex Polytechnic, Cat Hill, Barnet, Herts EN4 8HT.

INVALUABLE SOFTWARE

Sir, There are many useful engineering software and hardware developments taking place in such subjects as structures, electronics and graphics in places like Harwell, Sussex University, Nottingham, Kings College, etc, which to the serious user could be invaluable.

As a regular *Acorn User* reader, I have not come across a survey of available software in this category. Also, the modem/mainframe accessibility to these programs could be a boon in the future. Can *Acorn User* advise where a comprehensive list of available programs can be found?

T Williams
Sussex

We do not know of such a list, but would like any readers who are aware of such to send us in one, or let us know where it can be found.

The news pages do try to cover software of this kind, and we actively encourage people to pass information through our free ad and £10 ad pages – not to mention setting up a user group.

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VIEW
Version 2.1 of Acorn's wordprocessor. Allows 80 column editing, printing direct from memory, etc. £47.95

VIEW 3.0
A version of View suitable for the BBC+. Comes with a cassette version of the Printer Driver Generator. £79.95

HI-VIEW
A disc based version of this popular wordprocessor for the 6502 second processor giving 47k of user memory. £44.95

VIEWSHEET
Acorn's spreadsheet ROM giving 255 rows by 255 columns, multiple windows, works in any mode, wide use of function keys, fully compatible with View. £47.95

VIEWSTORE
Acorn's new database ROM. Works in any screen mode; many powerful sorting facilities, can be spreadsheet or user defined card layout. Max record size is 60k. Output can be sent to View and Viewsheet. Comes with comprehensive manual, utilities disc, etc. £54.95

GRAPHICS ROM
Acorn's new 16k graphics ROM giving many new commands for extensive graphics. Circles, ellipses, arcs, rectangles, parallelograms, segments and sectors etc. are all available. Comes with manual and utility cassette. State B or B+ version. £27.50

BASIC EDITOR
Acorn's new editor ROM allowing all the normal wordprocessor facilities to be used on basic programs. Features include block copy, block move and use of labels. £28.95

TERMULATOR
A terminal emulation ROM. Emulations provided are VT100, VT52, 4010, teletype, hardcopy and special BBC terminal. Comes with user guide and a set of function key strips. £31.95

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A full implementation of the ISO standard supplied on two ROMs with two comprehensive guides. 6502 disc versions also supplied. £59.95

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A full implementation of the Logo language supplied on two ROMs. Comes with manuals, user guide, example disc and reference card. £59.95

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LETTERS

SPEAK TO ME PLAINLY

Sir, I am a relative newcomer to computing and to *Acorn User* but I don't believe I'm a complete dope! However, on reading some of the March issue I begin to wonder.

Take 'Master Work. Our technical editor takes the lid off the simplest of Acorn's new series of micros'. I'm OK until the paragraph about the Break key – I'd love to be able to turn mine off and I suspect that many other owners would too. In the next sentence I'm floored because I don't know about the 'software key'. Presumably this is *KEY 10 but it's hardly calculated to endear me to your technical editor.

On page 74 I'm invited to read about the memory map and study 'figure 1'. As this is two pages away I need a second copy of the magazine – if the photo on page 74 was swapped with figure 1 the problem would have been solved. Problems with the layout of articles are a regular occurrence in computer publications.

Lastly, can I make a plea for plain English? Each edition contains a wealth of (I presume) useful information but it's written in jargon. I believe most areas of computing can be explained in words of two or less syllables. I enjoy reading *Acorn User* (some of it anyway) so please accept my criticism in the constructive spirit in which it is intended.

Brian Bowell
Mid Glamorgan

UNFAIR CRITICISM

Sir, I was disappointed to see part of a letter of mine which was published in November's issue of *Acorn User* quoted by Beebug/Beebugsoft in an attack on you.

My original letter to *Acorn User* was edited and had the full text been published readers would have seen that my rebuke related to a few specific articles rather than *Acorn User* as a whole.

In fact *Acorn User* is still my favourite even though I subscribe to *Practical Computing*, *Personal Computer World* and *Beebug*. I've subscribed to both *Beebug* and *Acorn User* since their beginnings.

When my truncated letter was published n November 1985, I had intended to write to congratulate *Acorn User* on its content. I regret not having done so as *Beebug* has now published two small quotes from my published letter as its response to some valid criticism appearing in *Acorn user*.

I don't want to take sides but if one compares a typical issue of *Beebug* with *Acorn User*, the difference in size and presentation of content is staggering.

As a member of a 'a totally independent user group' (*Beebug* page 2, issue 1, April 1982) one noticed the gradual dropping of the original aims so admirably expressed in the first issues.

Beebug Publications Ltd, Beebugsoft Ltd and PMH Mailing Services Ltd gradually made their presence known. After a while the turnover must have exceeded £1 million annually if one adds in the income from subscriptions, software, distribution deals with High Street multiples and Computer Concepts, the Electron side of the business, hardware sales, advertising, etc.

As a 'member' I had often wondered why discounts obtained from suppliers were never fully passed on to the other members in the form of lower prices. In fact, *Beebug*'s own hardware prices always seemed to be near or at the maximum recommended price. There are dealers selling the same or very similar items at lower prices and some of them advertise in *Acorn User*.

The members' 25 per cent software discount is smaller than the trade discount at which I can usually purchase some of the excellent *Beebug* products.

Is it too late to revitalise the original aims of the 'Independent National User Group for the BBC Microcomputer' which, incidentally, on its May 1985 cover proclaimed itself to be 'Britain's Largest Computer User Group. Membership exceeds 30,000'?

Finally, may I assure everyone that I am not 'disgruntled readers' but merely one person, despite what *Beebug* printed.

Paul Janik
Jersey

EPSON HELP

Sir, I have just bought an Epson P40 which is good value for money and performs all my needs easily – until I wanted screen dumps in modes 1, 2 and 4. I tried the printer dumps given in your magazine for other Epson printers but to no avail. Can anyone help?

Andrew Jackson
Essex

Latest round-up of games high scores

Game	Publisher	Score	Player
Aviator	Acornsoft	30,450	P Hopgood*
Android Attack	Computer Concepts	1,495,105	Tim Hedger*
Arcadians	Acornsoft	98,020	Niaz Islam*
Battletank	Superior	108,500	Stephen Corcoran*
Castle Quest	Superior	2,240	Peter Simpson*
Chukkie Egg	A&F	30,275,420	Stephen Corcoran*
Crazy Painter	Acornsoft	279,790	Richard Arundale*
Cybertron Mission	Micro Power	715,960	Niaz Islam*
Fortress	Pace	129,250	Stephen Corcoran*
Frak!	Aardvark	20,000,200	Paul O'Malley*
Free Fall	Acornsoft	5,024	Philip Comber*
Hopper	Acornsoft	52,422	John Durrans*
JCB Digger	Acornsoft	131,450	Stephen Corcoran*
Killer Gorilla	Micro Power	836,475	Stephen Corcoran*
Match Day	Ocean	10-0	Matthew Pedeaux
Meteors	Acornsoft	498,500	P Ludgate*
Missile Control	Gemini	469,225	Ian Boffin*
Monsters	Acornsoft	283,000	Stephen Corcoran*
Mr Ee	Micro Power	944,350	Stewart Roberts
Moonraider	Micro Power	642,125	Stephen Corcoran*
Overdrive (BBC)	Superior	338,450	David Perry*
Overdrive (Electron)	Superior	1,011,720	P Ludgate*
Painter	A&F	203,690	Nigel Shaw*
Pengo	Watford	300,400	Stewart Roberts
Planetoids	Acornsoft	3,186,450	Stephen Corcoran*
Pole Position	Atari	384,250	Niaz Islam*
Rocket Raid	Acornsoft	161,460	Roger Austin*
Snapper (BBC)	Acornsoft	1,839,210	Peter Simpson*
Space Adventure	Virgin	4,890	Mark Bradshaw*
Starship Command	Acornsoft	8,420	Ian Boffin*
Zalaga	Aardvark	23,460,500	Ian Boffin*

Scores unbeaten since February 1986

Please say whether your score was notched up on a BBC micro or Electron when sending in your games high scores as in future issues we'll be publishing separate tables for each micro.

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates the single density capacity. The double density storage capacity is second one, (that within the brackets). All disc Drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track and which are 80 track. The 40 track ones are manufactured by EPSON, the world famous Japanese company, (non-tinted boxes). The 80 track drives are famous MITSUBISHI drives (tinted boxes).

With two prices in a box (e.g. £295/£299), the first price is for the standard drive and the second for the same unit in switchable type. Users of either of the two Watford DFSs will not need switchable drives as their DFS will provide software switching for them.
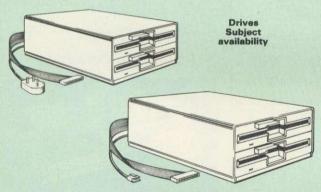
All our Disc Drives are Double Sided and will operate in both Single and Double Density modes. Extensive experience of the usage of disc drives suggests that the MITSUBISHI and EPSON drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.

Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high quality Epson and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate: extensive tests within our workshops have confirmed this. All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. (Ideal for Schools & Colleges. All single disc drives with power supply, (i.e. CS100, CS200 & CS400S) are supplied in a twin case with twin data cable for later inclusion of a second drive). At Watford we anticipate your needs of tomorrow not just today!

When using a BBC Micro, most people find themselves preciously short of space. The Watford's BBC Micro Plinths form an ideal way of recovering some of this space; your BBC, disc drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. Some of our competitors offer disc drives built into plinths, but these aren't as sensible as you might think. With a Watford Plinth, your disc drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen and paper, reference manuals, etc. Follow the trend with Watford Plinth.

Drives Subject availability

Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
100K (180K)	CLS 100 £75		CS 100 £116	
200K (360K)	CLS 200 £102	CLD200 £185	CS 200 £116	CD200 £199
400K (720K)	CLS 400 £104 / £105 CLS400S	CLD 400 £185	CS400 £123 / £124 CS 400S	CD400 £205
800K (1.44M)		CLD800 £194 / £195 CLD 800S		CD800 £218 / £219 CD 800S

- TWIN Disc Drive Case, complete with Power Supply & Cables **£35**
  Securicor carriage on Disc Drives **£6**

Prefix   **C** = Cased Drive   Suffix   **S** = 40/80 Switchable
        L = Less PSU
        S = Single
        D = Double

e.g.   CLS400S = Cased drive, Less power supply unit, Single 400K, Switchable (40/80 track).

MYSTERIES OF DISC DRIVES & DFS REVEALED

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive? What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin? What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford's new book entitled 'MYSTERIES of DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

£5.95 (Book No VAT)

3M – DISKETTES

Top quality 3M – SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All our discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick disc labels and write protect tabs.

- 10 × 5¼" S/S D/D 40 Track Diskettes   **£11**
- 10 × 5¼" D/S D/D 40 Track Diskettes   **£13**
- 10 × 5¼" S/S D/D 80 Track Diskettes   **£19**
- 10 × 5¼" D/S D/D 80 Track Diskettes   **£20**

- 10 × 3½" S/S D/D 40/80 track Discs   **£25**
- 10 × 3½" D/D D/D 40/80 track Discs   **£35**

FREE Durabeam Pocket Torch with every two boxes of 3M Diskettes purchased from us this month.

TOP QUALITY 5¼" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied complete with selfstick labels and packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

- 10 × **M4** S-S D/D 40 Track Discs **£10**
- 10 × **M5** D/S D/D 40 Track Discs **£12**
- 10 × **M7** D/S D/D 80 Track Discs **£17**

- 3" Double Sided Discs **£4** each
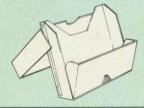
(For special Bulk Offer, see page 2 of our advert)

LOCKABLE DISC STORAGE UNITS

Strong plastic case that afford real protection to your discs. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

M35 - holds upto 40 discs   **£9**
M85 – holds upto 95 discs   **£12**

PLASTIC LIBRARY CASES

FOR 5¼" DISC STORAGE
holds 10 Discs.   **£1.80**

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use.

£8

DUST COVERS (For our Disc Drives)

Single (without PSU) **£3.20**   Twin (without PSU) **£3.85**
Single (with PSU) **£3.95**   Twin (with PSU) **£3.90**

EPSON NLQ ROM
for the BBC Micro

Harness the full potentials of your Epson RX & FX Printers. Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:
● Simply type *NLQ80/100 and a single VDU code to use NLQ print.
● NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
● Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
● Full UK character set; Standard 'pica size'; Proportional spacing; Enlarged; Underlined; Normal type.

The NLQ ROM is supplied complete with comprehensive manual.

P.S. NLQ ROM is compatible with the Torch Z80 system and can be used from within the Perfect Writer software.

Only: £25

VIEW PRINTER DRIVER
for NLQ ROM

This specially written printer driver has been designed to allow View access to the full features of our NLQ ROM.
A must for all VIEW and NLQ ROM users.

£7.00

THE NLQ DESIGNER

KAGA KP810/910 and Canon PW1080 are two superb printers, as our many thousands of satisfied customers would surely attest to. One of it's particularly strong points is the NLQ option that it offers; perhaps one of the more weaker points is the effort required to design your own custom NLQ font.

Well the solution is here NOW in the shape of Watford's NLQ DESIGNER ROM! For the BBC Micro. This powerful piece of software allows easy design and entry of a full NLQ font, with further fonts recallable from disc. Once a font has been programmed with the versatile NLQ DESIGNER, it can be saved to disc, downloaded to your Kaga (or Canon) printer, or even programmed into an EPROM (given the appropriate hardware) and then plugged directly into your printer so that it is available immediately when you turn it on. Downloadable Fonts require 6264 RAM chip fitted.
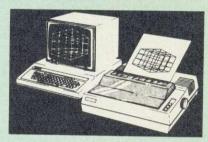
A 40/80 track format disc containing 3 example fonts is included in the package.

(P.S. This ROM is not suitable for Epson printers as they don't normally have NLQ ability. Keep reading our adverts though — work is in development!)

● NLQ Designer ROM & FONT Disc **£25**
● Kaga Individual FONT ROMs **£15**

(Write for further details).

DUMPOUT 3

A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!
The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.
Two commands are used to operate the dump routines:
*GIMAGE – This provides a full graphics dump of any graphics mode, plus modes 7 and '8'. There are many optional parameters but you need only specify the parameters you wish to change.

Features available include:

● Vertical and horizontal scaling through all the graphic modes and mode 7
● Rotation of the image produced through 90, 180 and 270 degrees
● Left hand indentation setting
● Screen dump window definition
● Colour grey scaling
● Two tone fast dump
● Special colour mask
● Mode 7 contrast expansion
● Mode 7 contiguous dump
● Key triggered dumps
● User port switched dumps

What does the independent press say!

Practical Electronics, May 1985
"The Dump Out 3 ROM from Watford Electronics represents one of the most sophisticated types of printer dump utilities available for the BBC Micro . . .".

"an extremely sophisticated and powerful dump utility".

"VERDICT – Dump Out 3 ROM has all the facilities which you are ever likely to need for producing printer dumps. The facilities available work extremely well and if printer dumps are something which you require, then this ROM can be recommended to help you to get the best out of your dot matrix printer".

The Micro User Feb. 1985.
"Well, here is that winner"!

"provide(s) some rather sophisticated screen dumps. Producing high resolution paper copies of graphic screens in any (graphics) mode will be the major reason for buying this ROM, and this is where Dump Out 3 performs PAR EXCELLENCE". (Our capitals for their italics.)
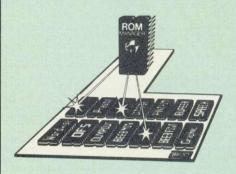
"The versatility of *GIMAGE (the graphics dump command) when using these parameters is amazing. Pictures of almost any size, shape, contrast or distortion may be produced without the need for a reducing photocopier or trick photography".

"Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC micro. It is easy to use yet highly versatile, and caters for all BBC screen modes in multitone high resolution printing. Whole, partial, rotated and scaled screens may be dumped to almost any BBC compatible dot matrix printer (see our list at the end of this advert). At £25 it must represent excellent value for money and surely cannot be beaten".

Designed for use with the following printers:
CP80, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, LPVII, NEC PC8023, DMP100/200/400, Mannesman Tally etc.
Price including comprehensive manual

£25

ROM MANAGER

Probably the most powerful way of expanding the BBC micro is from the use of Sideways ROMs. One problem faced by the avid ROM collector is that of ROM command clashes. The solution is very simple in the form of the ROM that "Provides comprehensive management of all your installed ROMs". (Quote from BEEBUG November '84.)
Basically, ROM Manager offers you the ability to turn off any installed ROM, or to send any * command to any specific installed ROM. It is said that imitation is the sincerest form of flattery – Acorn's BBC Plus features many of the abilities of this powerful ROM.
Many more facilities available.

SPECIAL OFFER £18

BEEBFONT ROM

BEEBFONT is a remarkable and different concept in BBC software. It allows you to display text on the screen in 13 different styles. It is supplied complete with a Spooler and Editor on 40 or 80 track disc.
(Please write in for technical details).

ONLY £25

BEEB PRINTER ROM

"Makes Printing Childs Play"

This utility ROM is designed to simplify using all the facilities of your printer. It has many facilities:
★ Selection of printer modes such as underline, font and size is by 'Single Key' operations.
★ From Wordwise, a single number following OC will select a mode rather than a long and incomprehensible string of control codes. This makes using your printer with Wordwise much more convenient.
★ When using Basic (or other languages) you can have control over the formatting of the output to the printer in the style of a wordprocessor. You can define page top, bottom and side margins etc. with intelligent page skip for binders an option. All supported printers will now respond to form-feed etc. commands.
★ User defined characters are printed as you see them on the screen so that non-standard characters are automatically printed out correctly.
★ Commands select the options for the following printers:
GP100, STAR, NEC, MX/FX, KAGA, LP/VII/DMP100, DMP200.
Operates with either parallel or serial interfaces.
★ Supplied with a 50 page manual that is very comprehensive and easy to follow. Please specify printer type when ordering so that we can send the correct function key strip.
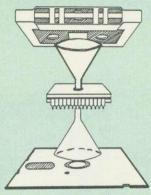
Price: £25

TRANSFEROM
(Tape to Disc Utility)

The only TAPE to DISC Utility ROM that works with our Double Density Disc Interface.

This advanced and sophisticated utility ROM for the BBC Micro has the following features:

- Fully menu driven for ease of use
- Copes with locked programs
- A very comprehensive built in copying features
- Copies very long adventure games
- Supplied with comprehensive manual
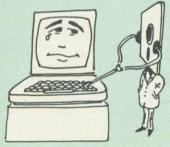
TRANSFEROM is now available in BOTH single and double density versions. The single density version works with both the Acorn and Watford single density DFSs. The double density version works with the Watford DDFS system only.

TRANSFEROM takes your software on tape and saves them onto disc. TRANSFEROM does not stop when one disc is full; you just insert another disc in and carry on with that one! Surely this is the most valuable investment you could make if you have tape software that you wish to transfer to disc! Please specify version required – Single or Double Density.

£25.00

All prices exclusive of VAT

DIAGNOSTICS DISC

The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large degree of patience or to find your nearest dealer and pay him to find out what is wrong.

At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

Continued

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

ROMAS

THE CROSS ASSEMBLER AND MACRO EDITOR FOR SERIOUS PROGRAMMERS!

ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

.6502, 65C02, Z80, 8085, 8041, 6809 and Z8 P.S. This includes the Acorn 6502 & Z80.

ROMAS features a powerful expression analyser, making complex table easy to generate. To aid in documentation, fully formatted assembly listings may be produced, with full symbol table output at the end.

ROMAS is provided with a powerful cross referancer to produce a listing of all the labels in a given "source" program; this makes it easy to check to see if you are about to duplicate a label.

The Macro Editor

Features of this powerful editor provided with the ROMAS package include:

- Works in all 40 and 80 column screen modes
- Fast load and save speeds
- Continuous line and column number displays
- Search, replace and move; all available in macros
- Command repetition

The ROMAS package includes a comprehensive manual, providing detailed documentation and plenty of examples.

A give away at . . . **Only £45**
Please specify 40 or 80 track disc when ordering.

ADE

'Systems' complete program development package in a 16K ROM. We are now supplying the new 6502 2nd processor compatible version.

SPECIAL OFFER ONLY **£34**

ULTRACALC 2

The mark 2 version of the BBC Publications' extremely popular electronic spreadsheet ROM.

Only: **£66**

THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering.

Only **£20**

ROM-SPELL
"way ahead of any competition"

ROM-SPELL is probably THE most advanced and fastest spelling checker available for the BBC Micro. Printed below are some extracts from a recent independent review (A&B Computing Nov. '85), which we feel sure will convince you that this is THE only spelling checker worth considering.

'The editing system is very neat and simple, instead of replying to queries and beeps all of the time . . .'
'The other feature which places ROM-SPELL way in front of any competition is the ability to examine the user dictionary, so any spelling mistakes that have found themselves on the disc can be examined and taken out if necessary".
". . . that it is compatible with many of the popular word processors on the market is a good indication that ROM-SPELL is going to be a very popular product indeed".
". . . ROM-SPELL is by far the best spelling checker for the unexpanded BBC B (with or without word processor). It boasts features which are hard to find on conventional spellcheckers on CP/M and MSDOS, namely Spellstar and has a speed/performance ratio of roughly the same as its CP/M cousin. The difference is that the CP/M version would cost the best part of £500".
". . . and with such vital house keeping features as an ambiguous word checker, the ability to edit the user dictionary, a comprehensive manual that is both easy to read and actually ENJOYABLE to learn from, . . . I feel confident that ROM-SPELL will woo the word processing public with no problems at all".

Don't settle for less, Buy the best.
ROM-SPELL costs only **£25**
(Please state 40 or 80 track disc)

REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£13 (40 or 80 track)

BEEBMON

BEEBMON is the most powerful and versatile machine code monitor from Watford Electronics. BEEBMON offers some superb features specially designed to make the task of understanding and debugging machine code easier; indeed BEEBMON is probably the only product with sufficient power to aid in the debugging of such complex pieces of software as a DFS.
Offering a total emulation mode, BEEBMON can be used to single step through code anywhere in memory. All breakpoints are emulated and the workspace is totally relocatable, allowing for the simulation of all those "awkward" pieces of code.
(Write in for technical details.)

£24

DISASSEMBLER ROM

Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use progammers tool.

Please write in for technical details.

ONLY **£16**

Continued ⟶

BOOKS (No VAT on Books)

21 Games for the BBC Micro	£5.95
30 Hour BASIC (BBC Micro)	£7.95
40 Best machine Code Routines	£7.95
6502 Assembly Language Program	£19.95
6502 Application	£11.95
6502 Assembly Language Subroutines	£19.95
6502 Development System	£7.50
68000 Assembly Lang. Programming	£19.95
A Young persons Guide to BBC Basic	£5.95
Advanced Disc User Guide	£14.95
Advanced BASIC ROM User Guide	£9.95
Advanced Machine Code Technique for BBC	£7.95
Advanced Programming for the BBC Micro	£6.95
Advanced User Guide for BBC Micro	£11.95
Advanced Graphics with BBC	£9.95
Assembly Language Programming on BBC Micro	£11.50
Advanced Programming Techniques for the BBC Micro	£8.95
Adventure into BBC BASIC	£6.95
Applied Assembly Lang. for BBC	£7.95
Assembler Routines for the 6502	£7.95
Assembly Language Programming FOR the BBC Micro	£8.95
Assembly Language Programming on the BBC & Electron	£8.95
Basic ROM User Guide	£11.95
Basic User Guide for BBC Micro	£10.00
BBC B+ User Guide	£14.95
BBC BASIC	£5.95
BBC Forth	£7.50
BBC Machine Code Portfolio	£7.95
BBC Micro add on guide	£7.95
BBC Micro Advanced Reference Guide	£10.95
BBC Micro Advanced Programming	£9.95
BBC Micro Book BASIC Sound & Graphics	£7.95
BBC Micro ROM Book	£9.95
BBC Micro **ROM PAGING** System Explained	£2.00
BBC Micro Disc Companion	£7.95
BBC Micro in Education	£6.50
BBC User Guide	£10.00
BBC Wargaming	£8.95
BCPL User Guide	£14
Business Applications on BBC	£7.95
Complete FORTH	£6.95
CP/M - 86 User's Guide	£19.95
CP/M Bible	£16.00
CP/M Handbook with MPM	£9.95
CP/M Plus Handbook	£13.95
CP/M Soul of	£14.95
CP/M The software BUS	£8.95
Creative Animation & Graphics	£7.95
Creative graphics on BBC Micro	£7.50
Disc Drive Projects for Micros	£5.45
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
Disc Programming Techniques	£7.95
Discovering BBC Micro Machine Code	£6.95
Disc System for the BBC Micro	£6.95
Exploring FORTH	£6.95
Filing System & Databases for the BBC Micro	£7.95
FORTH on the BBC Micro	£7.50
Functional Forth for the BBC Micro	£5.95
Games BBC Computer Play	£6.95
Graphics for Children	£6.95
Graphs & Charts on BBC Micro	£7.50
Guide to BBC ROM	£9.95
Hackers Handbook	£4.95
Hackers Handbook - New	£6.95
Handbook of Procedure & Functions for the BBC Micro	£6.95
Interfacing & Robotics on BBC	£7.50
Into View	£4.50
Introduction to COMAL	£9.50
Introduction to LOGO	£6.95
Introducing CP/M on the BBC Micro Z80 2nd Processor	£9.95
Introducing LOGO	£5.95
Introduction to FORTH	£8.95
Introduction to PASCAL	£16.50
ISO-PASCAL Reference Manual	£9.95
Let your BBC teach u to program	£5.45
LISP	£11.95
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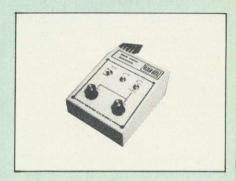
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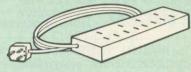
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IT'S QUICKER BY TUBE

Speed up data transfer across the Tube by including software in the BBC micro and second processor to enable them to communicate with each other

Martin Chaplin

This article forms the final part of a discussion of extensions to the 6502 second processor HiBasic. The first part, in March, described an improved and extended assembler to take full advantage of the more advanced 6502 chips now in use.

The 6502 second processor for the BBC micro is clearly a very useful addition to the system. It allows the use of a more powerful 6502 chip, faster programs and significantly more RAM. It is connected to the BBC micro through the Tube interface which allows both microprocessors to share the work by running in parallel.

There are some fairly unsophisticated facilities provided for transferring bytes across the Tube which are documented in the user guide. OSWORD calls 5 and 6 allow the second processor to read from, and write to, the BBC micro motherboard, and OSBYTE calls &92 to &97 read from, or write to, the mapped input/output pages &FC, &FD and &FE. These calls, however, only transfer one byte at a time. Given the speed of operation possible for the Tube operation (up to 100,000 bytes/

second), this speed of transfer is miserably slow, at about 1500 bytes/second. So we need faster operation in both directions.

The programs presented here set up such a system and allow it to be incorporated into a Basic program by assigning the unsused keyword token &CE to the introduced keyword 'TUBE'. A complete mode 2 screen (20,480 bytes) can be transferred in just over 210 milliseconds in a Basic program. The CALL keyword function is also extended to allow calls to be made from a Basic program in the second processor to machine code in the

ILLUSTRATION BY PAUL ALLEN

BBC micro's RAM or paged ROM. The paged ROMs can be selected by an OSBYTE call (OSBYTE &A4 or *FX164), making use of a previously unused OSBYTE parameter.
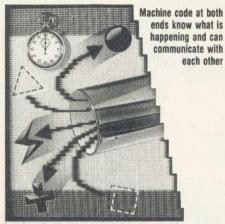
The problem with fast byte transfers across the Tube is mainly concerned with letting one end know what the other is doing! This is satisfactorily solved by including machine code at both ends which know what is happening and can communicate with each other.

Tube registers

There are eight Tube registers at either end, four are 'status' which indicate whether there is a byte waiting to be read (bit 7 set, =1) or transmitted (bit 6 reset, =0) in the adjacent 'data' channel. The status bytes are easily read by the BIT instruction followed by BPL (bit 7 tested) or BVC (bit 6 tested) branch instructions. The first pair of registers is reserved for OSWRCH calls (graphics and text), the second pair is used for other operating system calls (eg, OSBYTE and OSWORD), and the other two pairs for the filing system. The easiest pair of registers to use is the one used by the OSBYTE calls as this is checked regularly (up to 140,000 times/second) by the BBC micro.

The main byte transfer routines in my program use the unassigned OSBYTE code

164 (&A4). This entails sending a reason code (=6) followed by two data bytes and then the code (=164) to Tube channel 2. The reason code determines the jump address (&500 + reason code) in the BBC micro: in this case it jumps to the code for OSBYTEs greater than 159. The two data bytes are interpreted as the registers X and Y. The remaining data is sent

Machine code at both ends know what is happening and can communicate with each other

after this OSBYTE code. If this data is absent, the new code at the BBC micro end treats the call as a straightforward *FX164 call to check the presence of the code or change the ROM accessed (see later).

In either event, the data is redirected from the OSBYTE vector (&20A-&20B) to the

new code. After the byte transfer has been completed the second processor continues to execute its HiBasic interpreter and the BBC micro returns to its idler routine between &36 and &45 in zero page.

By choosing this rather indirect way of using OSBYTE &A4, the programs avoid notifying the second processor end of the Tube that OSBYTE has been used. If it was notified, it would annoyingly insist on waiting for the return byte which would both complicate and interfere with the byte transfer process.

Buffers

The buffers chosen for the programs perhaps need some comment. Locations &57-&8F in the BBC micro and &4F-&8F in the second processor are free in page zero.

The BBC micro has an extended character set which changes its PAGE to OSHWM + &5FF leaving the first free location as &1F00 (disc system) or &1400 (tape system). &1F00 is the address chosen for this program although other RAM may be used (eg, &A00) under certain circumstances.

The machine code at the second processor end has been put immediately below HIMEM, to enable it to be saved with the changed HiBasic, although again another RAM area

---

LISTING 1 PROGRAM NOTES: TUBE EXTENSIONS: SECOND PROCESSOR

This program (listing 1) should be run in the 6502 second processor under HiBasic.

The machine code generated is automatically saved, with the correct reload and execution addresses, as X_HIBAS in directory M. This code only operates with the code generated by the second program (M.IOTUBE) and may be run by:

    *RUN M.IOTUBE <RETURN>

    *RUN M.X_HIBAS <RETURN>

160-170: Second Tube channel

190: &50 holds the direction of byte-transfer (=&FF, 2nd -> IO; =0, IO -> 2nd; =1, CALL code)

200: &51-&52 hold the address in the BBC micro

210: &53 holds &A4, the new OSBYTE code

220: &54-&55 hold the number of bytes to be transferred

230: &56 holds 6, the reason code expected by the Tube for OSBYTE calls > &7F

240: &57-&58 hold the address in the second processor

300: evaluates an integer expression

310: cold start entry into HiBasic

320: gets next byte pointed to by (pointer), offset

330: continue HiBasic interpreter

400-440: code moved from HiBasic to make

way for Tube keyword entry

450-530: checks whether TUBEGET or TUBEPUT is being used. &A5 is the token for GET

610-640: discards unwanted letters

670-950: assembles addresses for Tube transfer from parameters in the Basic program line

750-810: fully tokenised TUBE ERROR message, ERR = &60

960: start of stand-alone code for fast BGET and BPUT

970-1080: send Tube parameters to the BBC micro

1110-1390: fast Tube transfer from the second processor to the BBC micro

1400-1650: fast Tube transfer from the BBC micro to the second processor

1660-1970: CALL extension to allow machine code programs to be started in the BBC micro. It transfers A,X,Y and C across the Tube

1690-1710: checks whether the CALL address is destined for the BBC micro (=&FFxxxx)

2000-2020: make room for 'TUBE' keyword in the keyword table

2030-2040: change the entry address into the keyword table

2050-2060: action address of the 'TUBE' keyword

2070: allow the 'TUBE' token (&CE) to be

recognised

2090-2130: insert 'TUBE' keyword, token and attribute into the keyword table

2150-2180: make room for 'TUBE' keyword in the keyword table

2190-2220: arrange jump for CALL keyword from HiBasic

2230-2280: sets new HIMEM

2320-2390: PROCsave; checksum and saves machine code. The checksum is correct for HIMEM set to &B800 (default) prior to running the program.

If only the fast BPUT and BGET routines are to be used, lines 250-330, 400-950 and 1660-2270 may be omitted. Then lines 90, 1390 and 2340-2380 must be changed to:

    90 HIMEM = HIMEM - &73

    1390 RTS

    2340 FOR X% = HIMEM TO &B7FF

    2350 sum% = sum% + ?X%

    2370 IF sum% < > &48D8 PRINT"Check for possible assembly error"

    2380 OSCLI "SAVE M.X_BGET " + STR$ ~ HIMEM + "B800" + STR$ ~ HIMEM

The system will still recognise the new *FX 164 calls.

The M.IOTUBE program must be run to set up the BBC micro end of the Tube.

may be more suitable. The fast Tube routines may be extracted from the HiBasic extension by omitting some of the assembly as outlined in the program notes.

There are two programs on the yellow pages to type in which set up the BBC and second processor (2P) at both ends of the Tube (listings 1 and 2). The specific details as to the use of the extensions to the HiBasic are set out in the program notes. There is also a test program, listing 3.

Additional Basic keyword

The keyword we add to Basic is TUBE, used as follows:

TUBEGET BBC_address, 2P_address, No_of_bytes

TUBEPUT BBC_address, 2P_address, No_of_bytes
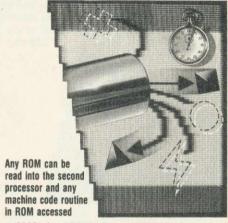
The new Basic keyword TUBE is used to transfer memory contents through the Tube. TUBEGET collects bytes (No_of_bytes) from the BBC (input/output processor) starting at memory position 'BBC_address' and places them in the second processor starting at '2P address'. TUBEPUT collects bytes (No_of_bytes) from the second processor starting at '2P_address' and sends them to the BBC (input/output processor) starting at memory position 'BBC_address'.

The ' TUBE command is tokenised (= &CE), as is the GET in TUBEGET. The minimum abbreviations allowed are TU.G and TU.P (TUBEG and TUBEP are also allowed). The syntax indicated above should be used.

The interpreter expects three numerical parameters after the TUBEGET or TUBEPUT command which must be separated by commas. Real numbers, hexadecimal

(prefixed by &) and variables may be used. There must be a space before the first parameter if it is a variable. If the instruction is incorrectly formulated a new error ('TUBE ERROR', ERR = &60) is produced.

A certain amount of care is needed in using these commands as they will corrupt the memory receiving the transferred bytes (&0000 to &2000 in the BBC and &0000 to

Any ROM can be read into the second processor and any machine code routine in ROM accessed

&0800 plus HIMEM to &FFFF in the second processor should be avoided).

CALL&FFxxxx is an extension of the normal CALL command. It allows machine code calls to the BBC if the address specified has &FF in its most significant byte of three. The A, X and Y registers and the carry flag are copied from the least significant bytes of A%, X%, Y% and C% and sent across the Tube to a machine code routine (set up by the user) at address &xxxx in the BBC micro. The CALL releases the Tube immediately, and allows both processors to execute independently. As the command USR uses the same code, it will not operate properly if the high address is used here. For example, PRINT USR&FFxxxx

returns the registers as entered without change, but does call the BBC program using these registers. Normal USR and CALL operations are unaffected.

New *FX call

The new *FX call has the following syntax:

    *FX164

    *FX164,X,Y

where X and Y are numbers. This is used for two purposes. As just *FX164 without parameters (or with any parameters except X = 1) it simply checks whether the appropriate code for these extensions is present at the BBC end of the Tube. If not present, the error 'bad command' (ERR = 254) occurs. If the code is present, no error occurs and &FF is returned in the X and Y registers.

If *FX164 is used with X = 1 (ie, *FX164,1,Y), the ROM in the socket indicated by Y (the ROM position) is selected (eg, *FX164,1,4 selects the ROM in socket 4).

With a ROM extension board up to 16 chips may be selected in this way. This call is mainly employed to select the memory used by the TUBE and CALL extensions.

Thus, any ROM can be read into the second processor and any machine code routine in ROM accessed.

This *FX call is not used by the operating system or DNFS, and is different from that used by the *Graphics* ROM (*FX162) and *Wordwise* ROM (*FX163) by Computer Concepts. The presence of the correct code at the second processor end of the Tube can be simply tested by checking that HIMEM has been changed.

LISTING 2 PROGRAM NOTES: TUBE EXTENSIONS: I/O PROCESSOR

This program (listing 2 on the yellow pages) should be run in the 6502 second processor under HiBasic.

The machine code generated is automatically saved, with the correct reload and execution addresses, as X_IOTUBE in directory M. This code only operates with the code generated by the first program (M.X_HIBAS) and may be run as described above. Under no circumstances should M.IOTUBE be *RUN more than once without an intervening hard reset as it changes the OSBYTE vector.

160-170: second Tube channel

180-190: paged ROM registers

210: &60 holds the direction of byte transfer (=0, IO - > 2nd; = &FF, 2nd -> IO; =1, CALL code)

220: &61-&62 hold the address in the BBC micro

230: &63-&64 hold the number of bytes to be transferred

240: OSBYTE vector

310-390: set up OSBYTE intercept

410-440: check for *FX164,1,ROM_position: code that chooses the ROM to be read

500: checks for *FX164 calls

540-550: checks to see whether more bytes are coming down the Tube

560-610: replace the return address on the stack by the zero page address &36, the address of the DNFS idle routine

630-690: recover the remaining Tube parameters

730-990: BBC micro end of the fast Tube transfers from the second processor to the BBC micro motherboard: control returns to &36 after RTS

1000-1260: BBC micro end of the fast Tube

transfer from the BBC micro to the second processor

1270-1400: BBC micro end of the CALL extension: control returns to &36 after CALLed code has been executed

1300-1350: recovers the carry flag and transfers to the flags register

1360-1390: recovers the accumulator

1450-1520: PROCsave; checksum and saves the machine code. The checksum is correct for assembly at &1F00, the first free location after the extended character set has claimed its RAM.

If only the fast BPUT and BGET routines are to be used, lines 720 and 1270-1400 may be omitted. The checksum in line 1500 must be changed to &5CA4 for assembly from &1F00. The machine code name in line 1510 should also be changed to M.IOBGET.

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JOIN THE MANDELBROT SET

You can create amazing graphics using the Mandelbrot set technique — when you enlarge a minute area of a shape, more and more detail will be revealed

David Johnson-Davies

Every so often an abstract mathematical topic captures the imagination of programmers to such an extent that thousands of hours of computer time are expended exploring it. Familiar examples are the search for larger and larger prime numbers in the early days of computers, and in the 1970s the programming of the evolution of cellular automata in John Horton Conway's game, *Life*.

One such topic currently arousing lively interest in computing circles is an object known as the Mandelbrot set.

The Mandelbrot set is an area in the two-dimensional plane defined by the behaviour of a simple function when repeatedly applied to points in the plane.

The whole Mandelbrot set is shown as the black region in the plot of figure 1(a). The coloured bands around the Mandelbrot set represent the behaviour of points as they get close to the set.

The great appeal of the Mandelbrot set lies in the complexity of its shape, which grows when minute parts of the region are enlarged and examined in greater detail. The figures in the two sequences of plots shown in figure 1(b) to (d) and figure 2(a) to (d) were obtained by exploring smaller regions of the Mandelbrot set. Each plot is an enlargement of the entire square area outlined in the previous plot of the same series.

In figure 1(d) a speck to the upper-right of the main Mandelbrot set turns out to be a miniature version of the whole set. In figure 2(d) a symmetrical whirlpool is revealed to have a tiny Mandelbrot set at its centre.

I'll describe the programs the BBC micro used to derive these plots. The Mandelbrot set is named after Benoit B Mandelbrot who has studied it as one example of a class of objects whose appearance remains fragmented or irregular at any magnification. Such objects are known as fractals, and other fractals have already been described in articles in *Acorn User*.
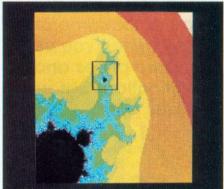
Figure 1b. Detail from main picture 1a

The mathematical interest in the Mandelbrot set is that complex and unpredictable behaviour results from the repeated application of a relatively simple function; the erratic and turbulent behaviour exhibited by this type of process may prove useful in modelling turbulence in physics.

Before looking at the function which gives rise to the Mandelbrot set, I'll examine a simpler function that behaves in an analogous way in one dimension.

A turbulent function

The following equations define, for a given starting value u, how the next term in the series should be obtained:

$$x_0 = 0$$
$$x_1 = x - x*x + u$$

The function is then repeatedly applied, or iterated, feeding the value of x back into the function to give a new value of x.

The iteration can be expressed by a Basic function FNt(u) as follows:
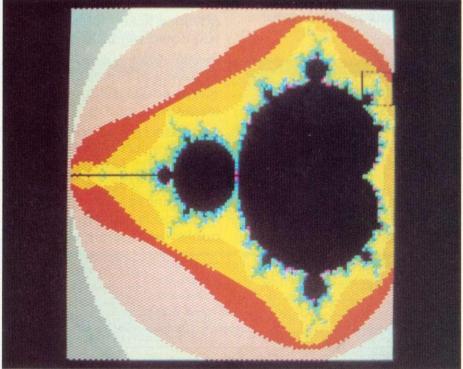
Figure 1. The Mandelbrot set (a) has infinite detail. If we zoom in on the small boxed area, the result is 1b, and so on . . . These pictures can be generated using the values from table 1 with listing 2

```
50 DEF FNt(u)
60 N% = −1:x = 0
70 REPEAT x = x − x*x + u:N% = N% + 1
80 UNTIL N% = 255 OR ABS (x) > 100
90 = N%
```

The variable N% counts the number of iterations carried out for a given starting value of u. For some values of u the value of the function rapidly becomes very large; because of the x^2 term it is clear that as soon as the size of the function ABS (x) exceeds some criterion value, say 100, it will continue to grow without stopping. In such cases we count the number of iterations before this happens, eg, u = 2.4 takes seven iterations to exceed the criterion:

2.4, −0.96, 0.5184, 2.6497, −1.9710, −3.4561, −13.0004, −179.6111

and so FNt(2.4) = 7.

However, there is a set of starting values of u for which repeated application of the function never causes x to grow large. I'll call this one-dimensional set the 'T' set. For example, the behaviour for u = 2.0 is: 2, 0, 2, 0, 2, 0, 2, . . . etc.

The value of x cycles indefinitely. The behaviour of the function is followed for a convenient number of iterations, in this case 255, and so FNt (2.0) = 255. If this number of iterations is completed without the value of x exceeding the criterion, starting point u is defined as lying within the 'T' set.

The program TURB1 in listing 1 on the yellow pages plots the behaviour of this iterated function FNt(u) over a given range of values of u. It prompts for two numbers – the starting value to be plotted, x, and the range
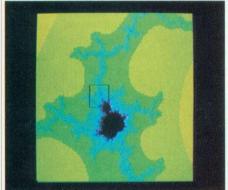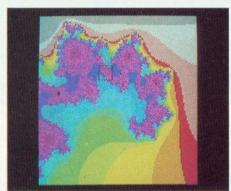
Figure 1c. Zoom in from 1b

over which the values should be examined, s. In other words, to plot the range u = 2 to u = 3 the values x = 2 and s = 1 should be given. The program divides this range into 256 points and plots the value of FNt on the vertical axis for each of these points.

The result of this plot is shown in figure 3. Values up to approximately u = 2.25 belong to the 'T' set. Beyond u = 2.25 the behaviour of FNt(u) becomes highly erratic. The number of iterations needed for the function to exceed the
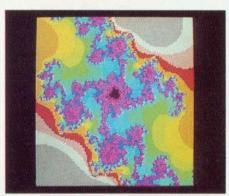
Figure 2. This sequence is yet another part of figure 1a. The fourth shot has a tiny Mandelbrot set at the centre of the 'whirlpool'. See table 1 for the values to generate these pictures from listing 2

criterion value varies wildly from one point to another close to it. The fractal nature of this function will be seen if you try plotting smaller ranges of values within the region of turbulence; for example, between u = 2.3 and u = 2.300001.

The Mandelbrot set

The iteration just described defines a set of points in one dimension. In a similar way, the Mandelbrot set is a set of points in two dimensions defined by a function in x and y when iterated with a given starting value. Stable starting points which when iterated remain small, are said to belong to the Mandelbrot set. Starting points which cause the function to grow rapidly are said to lie outside the set. The function which causes this behaviour is most simply defined in terms of complex numbers. The following description avoids the need for an understanding of com-
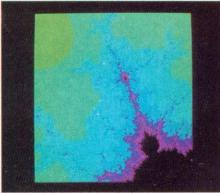
Figure 1d. Note the miniature Mandelbrot set!

plex numbers by giving the function in terms of ordinary arithmetic, as it would normally be expressed on a computer.

The Mandelbrot function of a point (u,v) is simply defined by:

$$x_0 = 0$$
$$y_0 = 0$$
$$x_1 = x*x − y*y + u$$
$$y_1 = 2*x*y + v$$

This can be expressed in Basic as a function FNm (u,v) as follows:

```
60 DEF FNm (u,v)
70 N% = −1:x = 0:y = 0
80 REPEAT y2 = y*y:x2 = x*x:
y = 2*x*y + v:x = x2 − y2 + u:N% = N% + 1
90 UNTIL N% = 255 OR x2 + y2 > =4
100 = N%
```

This time we use the distance of the point (x,y) from the origin as a measure of the size of the function. It is easily shown that as soon as the distance of (x,y) from the origin exceeds 2, the size of the function will then continue to increase rapidly with successive iterations. The entire Mandelbrot set therefore lies inside the circle defined by:

$$x^2 + y^2 = 4$$

and we can disregard points outside this circle, coloured grey in figure 1(a). In FNm (u,v) we therefore iterate until:

$$x*x + y*y > = 4$$

Again, we follow a point for up to 25 iterations. This maximum number of iterations was chosen so that the numbers will fit into one byte when they are to be saved to disc in

MANDEL2. With a higher value the boundary of the Mandelbrot set is slightly sharper, at the expense of longer calculation times.

Points for which FNm(u,v) = 255 belong to the Mandelbrot set, and are traditionally coloured black. The equally fascinating behaviour of points outside the Mandelbrot set can be shown by using different colours to represent the number of iterations before FNm(u,v) exceeds the criterion. We have seven remaining colours to assign to the 254 different possible values of FNm(u,v). The way that these colours are assigned will be crucial in determining the amount of detail that can be seen in the area surrounding the set.

There are two possible approaches to assigning these colours. The first is to calculate a fixed mapping of function values to colours,

	x	y	s
1a	−2.0	−1.25	2.5
1b	0.25	0.5	0.25
1c	0.34	0.63	0.04
1d	0.353	0.647	0.005
2a	−0.9	0.15	0.2
2b	−0.737	0.25	0.025
2c	−0.725	0.257	0.006
2d	0.7228	0.26055	0.0005

Table 1. The values needed to produce figures 1 and 2

and then use this mapping for all pictures produced for different parts of the Mandelbrot set. The advantage of this is that in a series of enlargements, such as in figure 1, successive pictures maintain the same colours for the same features in the plots. Also, the display can be built up as the picture is calculated.

The second approach is to calculate the value of the function FNm(u,v) for every point on a particular plot, and then on the basis of the values present in that plot assign the colours to give the desired detail. This approach was used to give the second series of four plots in figure 2 and a program using this method is given towards the end of the article.

Mandelbrot set program

The program MANDEL1 (listing 2), uses the first approach of assigning colours to points not in the Mandelbrot set to give a series of coloured contours using a fixed mapping function. It plots the points as they are calculated directly in eight colours within a square of resolution 128 x 128. Figure 4(a) to (d) shows a series of screenshots produced using the MANDEL1 listing.

The original program used the Acornsoft *Graphics Extension ROM* to give an additional eight shades consisting of mixtures of
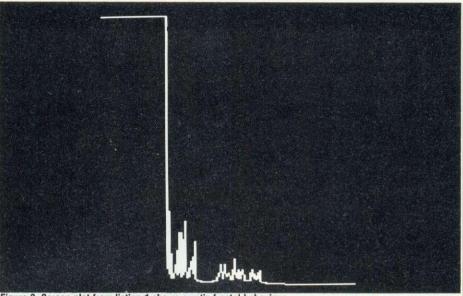
Figure 3. Screen plot from listing 1 shows erratic fractal behaviour

successive pairs of the eight standard colours. The version given here can be used to plot either with just eight colours, or with eight colours and eight shades using the *GXR* (or on a Master 128). The version of PROCgcol in lines 620-640 should be used for an eight-colour plot, with maxcol% set to 7 in line 60; for 16 colours the version of PROCgcol on lines 660-710 should be used, with maxcol% set to 15 in line 60. The 16 colour version works by setting D% and E% to the values of adjacent logical colours for odd values of B%, and to the same logical colour for even values of B%. The VDU statement in line 690 then sets up a shading pattern, which the GCOL statement in line 700 selects for plotting.

The program uses a rather unusual method of plotting the 128 x 128 points on the display so that a coarse lower-resolution view of the whole picture appears quite rapidly, enabling you to check that the desired part of the plot has been correctly chosen. Instead of plotting each of the pixels individually, starting at one corner and scanning the display, it 'tiles' the display, first with one 128 x 128 square, then with four 64 x 64 squares, then with 16 32 x 32 squares, each time filling the square with the colour of the pixel in the lower left-hand corner (lines 560-590). The test on line 530 ensures that each of the 128 x 128 values is actually only calculated once, so that the program takes just marginally longer than plotting individual pixels in strict sequence.

The main program begins on line 60. It first sets up a text window (line 100), and then prompts for the bottom left-hand point of the square to be plotted, x and y co-ordinates, and the length of the side of the square s. The entire

Mandelbrot set fits in the square with origin (x,y) = (−2,−1.25) and side s = 2.5. The plots in figures 1 and 2 were made with the values of x, y, and s shown in table 1.

For each point in the 128 x 128 area the program calls PROCpt which calculates the co-ordinates (x,y) of the next point to be plotted and calls FNm for that point. The value returned is then mapped to one of the screen colours by the array C%(1) . . . C%(255) whose elements are set to the values 0 to maxcol% to determine the mapping of function values to colours. PROCgcol is called to choose that colour for subsequent plotting, and a square is plotted at the screen co-ordinates X%,Y%.

The mapping function, found after much experimentation, is logarithmic and is given in lines 130 to 160. The VDU statements in lines 170-220 reassign the physical colours to logical colours 0 to 7 to give a pleasing sequence of colours. The resulting assignment of contour levels to colours is given in table 2, for the eight-colour version.

Altering the contours

The assignment of colours to the 255 contour levels is a crucial process in achieving a good Mandelbrot plot; if too many levels are assigned the same colour, detail will be lost in the final plot. Conversely, if too many colour changes occur where the contour levels are changing rapidly, the display will be a blur of colour. The most flexible approach to plotting the Mandelbrot set and its associated contours is to save all the calculated points to a disc file; the assignment of the 255 contour levels to the more limited colours on the display can then be handled fairly quickly just by reading the points from the file.

The program MANDEL2 (listing 3) creates

white	red	yellow	green	cyan	blue	magenta	black
1-2	3-4	5-10	11-23	24-52	53-115	116-254	255

Table 2. Alignment of contour levels to colours for the eight colour version

such a 4k disc file of data; this time, the points are simply calculated in sequence and saved to the file without displaying them. As a measure of the program's progress, the column number J% is printed out for each of the 128 columns.

Plot data file

The program MANDEL3 (listing 4), reads the data file created by MANDEL2, processes the points, and displays the resulting plot. MANDEL3 first reads in the function values and counts the number of points for each value 0 to 255 in the array C%. It then assigns values to C% such that all function values with a value of 255 are plotted black, and the remaining 15 colours are each assigned to approximately equal numbers of points (lines 200-270). Finally in line 390 the random-access pointer is reset to the beginning of the file, and lines 400-490 plot the entire graphics display.

Again, two versions of PROCgcol are provided, and the appropriate version should be used depending on whether the *GXR* is available, with maxcol% changed to 15 in line 60 as necessary. Because of the large number of calculations needed for each plot, MANDEL1 and MANDEL2 can take between two and four hours to run to completion, depending on the range of values being explored. It is advisable to save a screen-dump of every successful plot for future reference, using for example *SAVE PX FFFF3000 +5000 typed in once the program has finished.

There are countless fascinating shapes waiting to be discovered in the vicinity of the Mandelbrot set; in fact, the infinite detail there
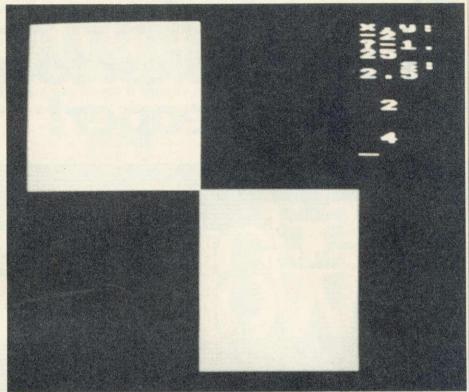
Figure 4. This sequence of four pictures demonstrates figure 1a being built up by listing 2. Note that the display for the number values is different in listing 2. (a) the start of a three-hour sequence

makes it certain that there are patterns which will go undiscovered forever. Readers finding particularly interesting regions in the set are encouraged to send them in to *Acorn User*, as screen dumps on disc. A review of the best plots will be featured in a future issue for the benefit of other explorers.

David Johnson-Davies' listings are on yellow pages 114 to 115.

The Mandelbrot set was the topic of the Computer Recreations column by A K Dewdney in the August 1985 issue of Scientific American. *A fuller account of the function is given in* The Fractal Geometry of Nature *by Benoit B Mandelbrot, published by W H Freeman & Co. The concept of iterated functions is discussed in chapter 16 of* Metamagical Themes *by Douglas R Hofstadter, published by Viking.*
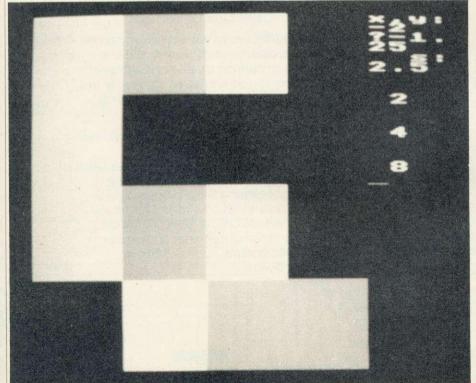
Figure 4b. After about 30 seconds
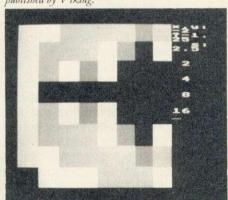
Figure 4c. Three minutes and the set can be seen
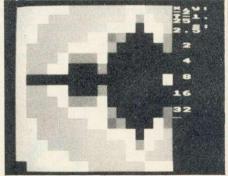
Figure 4d. Six minutes and detail starts

DIY DUMPING

Our printer expert provides a way for you to transfer user-defined characters to a printer automatically, and a printer dump program for character screens

George Hill

A hint referring to the automatic transfer of user-defined characters on the printer (Nov '85, page 49) provided the motivation for coming up with a mechanism by which this can be done, and you'll find three programs on the yellow pages using the technique. The last of these is a printer dump program for character screens which is similar to the machine-code version of the *Acorn User UserDump* ROM. These listings will work on Epson and Epson-compatible printers with double density graphics facilities such as the Citizen 120d, Star, Kaga Taxan, etc.

The function *CDUMP (character dump) on the *UserDump* ROM decodes the screen version of the characters, whether user defined or not, and produces a perfect printed image, independent of mode. Figure 1 shows an example. Listing 4 gives a sample screen using user-defined characters. It contains the procedure 'PROCreadparameters' which is also used in the dumping program to determine the current mode and set up the line-length and number of lines per page. This enables the program to run in any mode – though user-defined characters have no effect in mode 7.

The method of dealing with the characters depends on covering the eight 'horizontal' bytes per character of the Beeb's user-defined characters to eight 'vertical' bytes for the

Figure 1. Example screen in mode 2 dumped using listing 3 from the yellow pages

printer. This is possible, but unbelievably slow in Basic, and involves MOD and multiplication routines. Bit manipulation is much better accomplished in assembly language.

The machine code for doing this is assembled in DIM space in listings 1 and 3 and has

only minor modifications in listing 2 (added routines to read the character at the text cursor and to print the characters after translation).

The programs all place the ASCII value of the current character into a byte reserved for the purpose – 'char'. The routine (assembled at
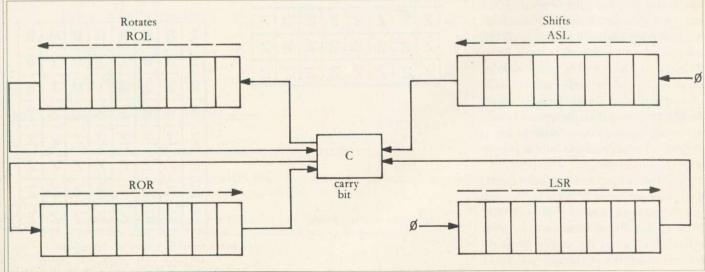
Figure 2. The 16 possible ways of dealing with bit transfers

PRINTERS

'code') first reads the character definition of this character by an OSWORD call, into eight bytes reserved for it, starting at 'cchar'. These are processed by 'htov' into eight bytes for the printer, starting at 'pchar'.

The processing method depends on the fact that 'shift' and rotate' operations exist on the 6502 which shift bytes either left or right. In all cases the bit shifted out is transferred to the carry bit. In the rotate instructions the previous contents of the carry bit are shifted in, while in the shifts, a zero is shifted in. Thus the carry bit can be used as a temporary home for a bit which is then transferred elsewhere. There are 16 possible ways of dealing with bit transfers, illustrated in figure 2. The particular combination used in this transfer is:

LSR byte 1
ROR byte 2

This shifts the least significant bit of byte 1 into the most significant bit of byte 2. Byte 1 has zeros shifted in to the right-hand end, and the bits shifted out of byte 2 go to the carry, but are 'lost' in subsequent operations (figure 3).

The graphics/text program HTOV (listing 5) illustrates how the bit-by-bit conversion is carried out – it is an animated 'visual aid' which might be helpful to teachers in other contexts. The variable delay at line 160 gives a 10 second delay between moves. This can be altered, or individual moves caused, by using the space bar. Figures 4, 5 and 6 illustrate a set of character bytes and printer bytes before, during and after conversion. They are print-outs from the HTOV program.

In listing 1, CHARPRT, single characters are prompted from the screen, either as their ASCII values or as characters, and their defined representations are printed. Figure 7 is a sample output from the program.

In TYPWRTR, listing 2, the printer reproduces exactly any text which is typed at the keyboard, using any character definitions you have altered. You can define Greek characters and type them in directly. If French accents are required, define them and type them in. You enter your text a line at a time, and it is shown on the screen (figure 8). The cursor 'sticks' at the end of the line, and beeps, just as it would on a typewriter. At the conclusion of editing the line (the Copy and Delete keys can be used as normal), pressing Return causes the line to be printed. The program runs in mode 3 giving an 80 character line length.

Note that the program allows *all* characters to be redefined, using *FX20,6, and so must run at &600 above the normal value of PAGE. If the value of PAGE seems too low for the current filing system the program is halted. You can change this by checking lines 240 to 290. If you have discs and the normal DFS

Figure 3. The combination of shifts and rotates used in this conversion

Figure 4. A set of character bytes and printer bytes before conversion

Figure 5. A set of character bytes and printer bytes during conversion

Figure 6. A set of character bytes and printer bytes after conversion

```
CHARACTER BYTES      CARRY

0  Z Z Z Z Z Z Z Z      Z
1  Z Z Z Z Z Z Z Z    BIT
2  Z Z Z Z Z Z Z Z
3  Z Z Z Z Z Z Z Z
4  Z Z Z Z Z Z Z Z
5  Z Z Z Z Z Z Z Z
6  Z Z Z Z Z Z Z Z
7  Z Z Z Z Z Z Z Z
```

```
1 1 0 0 0 1 0 0
0 1 0 0 1 1 1 0
1 1 0 1 0 0 0 1
1 0 0 0 0 0 0 1
1 0 0 1 1 1 0 1
1 0 0 0 0 0 0 0
0 1 1 1 0 1 0
0 0 0 0 1 0 1 0

7 6 5 4 3 2 1 0

PRINTER BYTES
```

chips, when the default value of PAGE is &1900, then simply prefix the program by:

1 IF PAGE < &1F00 THEN PAGE = &1F00:CHAIN"TYPWRTR"

Your desired character definitions can be carried out either externally by another program, or internally by altering PROCdefinechars (which currently only redefines A of the printing characters). I wanted to use another utility (DEFCHAR) to define the characters. To do this you must remove the *FX20,6 call, as this destroys any previously defined characters in the normal range.

Listing 3, CDUMP, is a procedure for merging with another program (for example the SPLSCRN program). It may then be activated by inserting:

PROCcdump

where you want the dump to occur. You'll find instructions for carrying out program merging in the user guide.

CDUMP will work in any mode, but will *not* print any dots produced by graphics commands or any characters printed at the graphics cursor. PROCreadparameters is used to read information for the printer, as well as characters per line and lines per page. These parameters are used to control the printing of the prepared bytes in PROCdump.

PROCdump (lines 10480 to 10650) is explained line-by-line below:

10490	Restore default screen and enable printer
10500	Set linefeed on printer
10510	Loop for vertical scan
10520	Set up printer to print correct number of dots
10530	Read character at text cursor (A% = 135, line 10770)
10540	Loop for horizontal scan
10550	Switch dots round
10560	Loop to print eight bytes
10570	Print one byte
10580	Double up if mode 2 or 5
10590	NEXT I%
10600	Disable printer, advance text cursor and enable printer
10610	NEXT X%
10620	Linefeed
10630	NEXT Y%
10640	Formfeed, reset printer and disable printer

The conversion of CDUMP to a full machine code program to dump the graphics screen is largely a matter of doing arithmetic in assembly language and adding a print routine. This is relatively simple if you are into that sort of thing. If not, *buy the very reasonably priced UserDump* ROM!

George Hill's listings to dump user-defined characters are on yellow pages 110 to 114

```
Type a character, or an ASCII code:A
A
Type a character, or an ASCII code:B
B
Type a character, or an ASCII code:C
C
Type a character, or an ASCII code:1
1
Type a character, or an ASCII code:2
2
Type a character, or an ASCII code:;
;
Type a character, or an ASCII code:*
*
Type a character, or an ASCII code:241
A
Type a character, or an ASCII code:242

Type a character, or an ASCII code:240

```

Figure 7. Sample output of listing 1, the CHARPRT program

```
THIS PROGRAM ALLOWS YOUR BEEB + PRINTER TO ACT AS A TYPEWRITER.

You can redefine characters (notice the A has been altered), and type in a line
at a time. They are printed when you press return.

If you redefine the characters correctly you can type in foreign characters.
I have redefined some of the more obscure ones to use as French characters.
Et maintenant je peux écrire en Français!!
forêt, sûr, hâte, tôt, à, frère.
```

Figure 8. The TYPWRTR program, listing 2, reproduces text with any character definitions you have altered

QUESTIONS FOR THE BOARD

Choosing an expansion board to extend the capacity of your BBC micro or Electron is not easy. Here we answer your most common questions and summarise what the options are

Chris Drage

The BBC micro was not designed to accommodate extra boards despite being able to cope with 16 paged ROMs. Physically a 12-socket board takes up a great deal of space inside the machine, and any board covering the Beeb's RAM area is inviting overheating problems with the resulting corruption of memory. Picking up the lines necessary for operation can provide some soldering headaches, although many boards are now of a plug-in-and-go design. Perhaps the main factors to consider when choosing a ROM expansion board are:

● Ease of installation
● Reliability in operation
● Physical stability of the board
● Offers sideways RAM
● Compatibility with future expansion plans

The reviews which appeared in the April and September 1985 issues deal with most of these points.

Options

For the maximum number of ROMs, the Exprom, ATPL and Watford SSRB boards provide for 16 paged ROMs. I have extensively used both the ATPL and the Exprom boards and found them easy to install and reliable. Another system worth considering is the Computer Village CVX16-2, but this one's awkward to fit. If you wish to use sideways RAM to the full, then the Ramamp RA32 board scores well. Utilising 32k of dynamic RAM it represents a cost-effective means of combining sideways RAM and ROM expansions, but the number of ROM slots available is limited to 10. The Aries B12 is another well-constructed board. Its ease of installation and reliability, combined with the fact that it may be used with the Aries B32 shadow RAM board, makes it an attractive option.

Several manufacturers have opted for externally mounted boards. Perhaps the most cost-effective and simple ROM expansion system is

the excellent ROM-cartridge system from Viglen Computers (reviewed in *AU* October 1984), which enables you to utilise an unlimited number of ROMs safely, although if you have 30 ROMs it might be more expensive than a ROM board. I do not recommend the use of externally mounted ZIF sockets as the risk to valuable ROMs is too great. Other larger, external boards are produced by GCC (Cambridge) and HCR Electronic Services. If you want the best of external ROM sideways RAM expansion then both these systems are sure to please. Provided you have additional driver boards installed, each has the added bonus of being portable. The Micro Pulse Rombox is an elegant but expensive way to expand one ROM socket. With the purchase of additional leads, this system is also portable.

All the ROM expansion options above provide various solutions to the BBC micro's lack of ROM sockets. You will have to judge for yourself whether you are likely to make sufficient use of the facilities each offers to justify the cost.

The system for you

Many people expand the sideways RAM potential of their computers in preference to obtaining extra ROMs, and again we are spoilt for choice. I'll offer a few pointers and include

the summary and score tables carried in December. Any changes to the figures are the result of hardware improvements, updated software (in Solidisk's case), and price changes. In addition, I've included several questions which are typical of those *Acorn User* receives on the subject of sideways RAM.

Q I am a novice. I simply want to add 16k of sideways RAM to my machine.

A Of the boards reviewed the Ramamp RA16 offers reliability and the best value for money. Easy to fit, but more expensive, is *Acorn User*'s own UserRAM.

Q What is battery backup?

A Many ROM boards provide a facility for you to add a small Ni-Cad battery at a later date. This is charged by the computer and provides a means for sideways RAM to maintain its current ROM image while the computer is switched off. This is particularly useful for those who are developing their own sideways software. The reviews in the April and September 1985 issues refer to the boards which provide battery backup.

Q What is write protection?

A Several RAM boards provide the facility of a write protect switch (or allow you to add one). Once invoked, the switch prevents any writing to sideways RAM by the user or by the ROM image.

RAM Boards	Solidisk 32/64/128	HCR 16/32	Ramamp RA16	Acorn User User RAM	Watford 16k Module
Design	3	4	4	4	2
Construction	3	5	4	4	4
Ease of installation	1	4	4	5	3
Versatility	5	4	4	4	4
Software provided	4	3	4	4	3
Documentation	4	3	3	4	3
Value for money	4	4	4	3	3
Total (out of 35)	24	27	27	28	22
Key: 5 *Excellent*, 4 *Good*, 3 *Satisfactory*, 2 *Poor*, 1 *Very bad*					

How the internal RAM boards score out of 35

COMPATIBILITY

Internal RAM/ROM boards

	RAM or ROM	Total ROMs available	RAM available	Installation	Cost	Software provided	Available from
ATPL	RAM/ROM	14 (socket 15 reserved for RAM)	16k as 2 × 8k CMOS (6264) static RAMs. Battery backup option	Plug in	£38 + VAT (Battery backup kits £17 + VAT)	N/A	ATPL, Station Road, Clowne, Chesterfield S43 4AB
Aries B12	RAM/ROM	12 (socket 0 reserved for RAM)	16k as 2 × 8k CMOS (6264) static RAMs or 8k as 1 × 8k CMOS RAM chip	Plug in (can be mounted externally (CPU carrier board £5.75 extra)	£40 + VAT	N/A	Aries Computers, Science Park, Milton Road, Cambridge CB4 4BH
Ramamp RA32	RAM/ROM	10	16k or 32k dynamic RAM on board	Plug in + 4 wires to solder	£59	10 utilities	Twillstar Computers, 17 Regina Road, Southall, Middlesex
Exprom	RAM/ROM	16 or 15 + 1 RAM position. Wait states may be selected for slow EPROMs	2k, 4k, 8k, 16k options (able to be mixed with EPROMs)	Plug in (may be mounted externally)	£59.95 (basic) £80.50 (fully expanded)	N/A	Anderson Electronics, 2 Hollin Park Road, Calverley, Pudsey LS28 5PU
Watford solderless ROM board	RAM/ROM	16	16k as 2 × 8k CMOS (6264) static RAMs. Battery backup option	Plug in	£32 + VAT (Battery backup £38 + VAT)	N/A	Watford Electronics, Jessa House, 250 Lower High Street, Watford, Herts

External ROM sockets

	RAM or ROM	Total ROMs available	RAM available	Installation	Cost	Software provided	Available from
Viglen	Cartridge	N/A	N/A	Plug in	£15.95 Cartridges £2.95 each	N/A	Viglen Computer Supplies, Unit 7, Trumpers Way, London W7 2QA

External ROM/RAM boards

	RAM or ROM	Total ROMs available	RAM available	Installation	Cost	Software provided	Available from
Micro Pulse Rombox	ROM	8 (1 is a ZIF socket)	None	Plug in	£57.44	N/A	Northern Computers, Churchfield Rd, Frodsham, Cheshire WA6 6RD
External ROM box	RAM/ROM board including own PSU	12 + 12 on optional second card	32k possible as 4 × 8k CMOS (6264) static RAMs. Also 6116,2016 RAM chips	Plug in	£80.50 (£33.35 for second card)	N/A	HCR Electronic Services, HCR House, Bakers Lane, Ingatestone, Chelmsford, CM40 B2
Ram/Rom 15	RAM/ROM	11 or 10 + 1 RAM position (plus 4 on BBC board)	2k, 4k, 8k, 16k options + rechargeable battery backup and several configurations (separate power supply available)	Plug in driver board (main board external)	£100.79	6 utility programs	GCC (Cambridge), 66 High Street, Sawston, Cambridge CB2 4BG

Internal RAM boards

	RAM option	RAM position(s)	RAM write protect	Installation	Cost	Software provided	Available from
SWR 32	32k	15, 14	No	Bared wires to push in (or solder) to legs of chips	£53	5 discs	Solidisk Technology, 17 Sweyne Avenue, Southend-on-Sea, Essex SS2 6JQ
SWR 64	64k	15, 14, 13, 12	No		£80	5 discs	
SWR 128	128k	15, 14, 13, 12, 11, 10, 9, 8	No		£125	5 discs	
HCR 16	16k	15 to 12	Yes	Plug in	£36.22	2 utilities	HCR Electronic Services (as before)
HCR 32	32k	15 to 12	Yes	Plug in	£47.72		
RAM 16	16k	15 to 12	Optional	Plug in	£32	8 utilities	Ramamp Computers, 25 Avon Drive, Whetstone, Leicester
UserRAM	16k	12, 13	No	Plug in	Pack 1 £38.50 Pack 2 £57.95	10 utilities 27 utilities + book	Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF
Watford 16k module	16k	Any	Yes + read protect	Plug in	£33.35	3 utilities	Watford Electronics (as before)

Summary of what the expansion boards have to offer, how much they cost and where to get them

Q Can I run any program in sideways RAM?

A No. Generally speaking only machine code programs written to load at &8000 to &BFFF can run from sideways RAM unless you wish to store programs in ROM filing system format. Looking at your disc contents (using *INFO.*.*), sideways ROM images normally appear as either:

   progname 008000 008000 004000 (16k)
or progname 008000 008000 002000 (8k)

Q Can I use the ROM Filing System?

A Yes, you can. One of the best packages I know of that enables you to convert your favourite software to run from sideways RAM is Beebugsoft's *Romit*. This package creates a ROM image of the program from which you can blow an EPROM. It works by downloading the program to its correct execution address in the main RAM and running it. Also, the disc supplied with UserRAM contains a ROM filing system formatter which will take standard Basic program files and format them, enabling them to be loaded into sideways RAM and subsequently loaded as required. A similar program can also be found in Bruce Smith's *The BBC Micro ROM Book* (published by Collins at £9.95).

Q Please tell me, how do you load software into sideways RAM?

A Most RAM board manufacturers provide information about how to do this. Typically the command: *LOAD ROMimage 8000 <RETURN> followed by either CALL!−4 (or pressing Break), will initialise a ROM image. The B+128 and Master use a unique command : *SRLOAD ROMimage 8000 W Q. Several suppliers such as Solidisk, Ramamp and HCR provide elegant menu programs to do this automatically for you.

Q I am an experienced programmer who wishes to develop my own ROM-based software in sideways RAM.

A The *Acorn User* UserRAM module has a very substantial range of software to support it and would be an ideal tool for this purpose.

Q I want to utilise 32k of sideways RAM so I can load two ROM images.

A The HCR Electronics 32k board is a reliable and well-designed board. The Solidisk 32k board can also be recommended if you are competent with a soldering iron.

Q I am in charge of a network of BBC micros in an educational institution. Should I purchase RAM expansion boards for each network station?

A Using sideways RAM is a cost-effective means of distributing ROM-based software. UserRAM, Ramamp RA16 and HCR 16/32k units can all be recommended. Most software publishers are now prepared to grant software licences for network users.

Q I have an ATPL Sidewise ROM board and want to add another 16k of sideways RAM to that already present.

A The only system I know that offers such expansion is the RAM module produced by C F Terrell, 7B Essex Gardens, Hornchurch, Essex RM11 3EH. Tel: (04024) 71426. Alternatively, the Aries B32 is now compatible with the Sidewise board.

Q I am a hobbyist who wants to use sideways RAM to the full.

A The Solidisk 64k system is probably the most versatile unit available at present. The new, updated software allows you to configure the RAM in a number of useful ways. You must be prepared for some headaches should you install it yourself, though!

Q I own an Electron. Can I upgrade it with any sideways RAM board?

A The only system available at the moment is the Advanced Computer Products RAM expansion system at £29.90 from 6 Ava House, High Street, Chobham GU24 8LZ. The Solidisk EFS disc interface is also supplied with 16k of sideways RAM. Both systems require a Plus 1 to be fitted to the Electron.

Q I want to upgrade my BBC model B to include shadow RAM, sideways RAM and sideways ROM expansions. Which units should I choose?

A For reasons of compatibility it is best to stick with one manufacturer's product. In this case the best solution would be to install the Aries

B32, B12 and two 6264 CMOS RAM chips. Look out for reviews of the new 256k RAM expansion system from Solidisk, which may also provide the answer.

Q I own a Viglen Cartridge ROM system. Is there any value to be gained in installing a sideways RAM board?

A Sideways RAM can be configured into DFS workspace or a printer buffer, both of which are advantageous. The Ramamp RA16 and Solidisk systems offer software to achieve this.

Q I have heard that sideways RAM can be configured into a 'silicon disc'. What is this and how useful is it?

A The Solidisk 64k and 128k boards can be configured into a silicon disc. The computer thinks that another disc drive has been fitted, thus DFS commands will work with the sideways RAM. The RAM-disc is volatile, so if you turn the computer off the RAM-disc is lost. It is useful for spelling checking and database work as the speed of access is about 10 times faster than any conventional disc drive.

Q I use a Solidisk 32k sideways RAM system but I want to expand my Beeb's ROM capacity. Can I do this without compatibility problems?

A There is only one reliable way that I know, and that is to add a Ramamp ROM'6S card. This will give you an extra six ROM slots with the 32k and 64k boards.

Q Is UserRAM compatible with any of the popular sideways ROM expansion boards?

A The only boards I have actually had UserRAM running properly with are the Watford MKII board and the HCR internal board. Maybe readers have found other combinations I have not been able to test yet.

The final answer prompts me to request readers to help us assemble a table of RAM/ROM compatible expansion boards. The only true test of compatibility of specific products is reliability in general – everyday use over a long period of time. If you have used any ROM board/RAM board combinations successfully we would love to hear from you.

Expansion Board	Ramrom 15	Exprom	Aries B12	Ramamp RA32	ATPL Sidewise	Watford SSRB	Micro Pulse Rombox	HCR External	Viglen Cartridge
Design	5	5	4	4	4	2	5	5	5
Construction	5	5	5	4	4	4	5	5	5
Ease of installation	5	4	4	4	3	3	5	5	5
Ease of chip removal/insertion	3	3	4	3	3	3	5	3	5
Versatility	4	5	4	5	3	4	3	5	3
Documentation	5	5	5	3	4	3	3	3	3
Value for money	3	4	4	4	4	3	2	4	4
Total (out of 35)	30	31	30	27	25	22	28	30	30

Key: 5 *Excellent,* **4** *Good,* **3** *Satisfactory,* **2** *Poor,* **1** *Very Bad*

How the internal RAM/ROM boards, external ROM sockets and external RAM/ROM boards score out of 35

COMPATIBILITY QUEST

Join *Acorn User's* quest to find which ROMs work with what, and to persuade software houses to leap into action to solve those incompatibility problems

Simon Williams

With only 16 slots available for expansion ROMs, and many times that number of products vying for attention, it makes sense to choose wisely, by studying advertisements and reading reviews in magazines such as *Acorn User*. Even then, though, you're guaranteed little, due to an exasperating and increasingly prevalent problem which rarely seems to get a proper airing.

The more sideways ROMs you buy, the more conflicts appear between different products. These 'tiffs' vary from one ROM answering another's command, to two ROMs refusing to live in the same machine together. There are various ways round these little battles, but none of them make life any easier for the average micro user.

Avoiding conflict

You can buy an extension zero insertion force (ZIF) socket and only plug in the ROM you want at any time. This can be awkward, however, if you need to call more than one ROM during a session. An alternative is a couple of sideways RAM units, into which you can load disc images of your own ROMs, but this removes the convenience of having 'instant' ROM software in the first place.

Another possibility is the 'ROM manager' ROM, which will 'knock out' other ROMs on request. Some routines even survive a hard reset and the chips can then only be reawoken with a specific command.

It still doesn't solve the problem of working out which ROM caused the conflict in the first place, however.

So why not find out from the software publisher before buying his product? Mainly because the standard reply is 'It's impossible to test our new product with every piece of software on the market'. Fair enough, but they should at least try some of the more obvious combinations. I recently had a new ROM which made *Wordwise Plus*, normally a very mild-mannered chip, include random disc catalogues in new text files! How about the disc utility chip which so disliked *Disc Doctor* that it turned it off each time the micro was reset! Or the trio of chips XROM, YROM and ZROM which require an impossible order of precedence, eg:

XROM > YROM AND ZROM
YROM > ZROM
ZROM > XROM

Not only are ROM conflicts annoying, but are often extremely hard to trace. Intermittent 'scuffles' may only break out when using obscure sections of code, and the conditions are then very difficult and time-consuming to reproduce. Gradually removing chips from an expansion board until you hit on the offending component may be some people's idea of fun but I've far better things to do with my computing time.

So what's to be done? Well, for a start, software companies could be encouraged to stick to the rules laid down by Acorn. Many of the conflicts between ROMs are brought about because the code is not written using Acorn's service routines.

For instance, ROMs which access the screen directly are asking for trouble. Then there are ROMs which need workspace (normally 'language' ROMs) and aren't choosy about where they find it. However clever a program is, it will not gain popular acceptance if it sits there in the micro giving no quarter to any other program in the machine.

But it isn't all down to the software companies. There are things users can do to help reduce the problems, and the most obvious of these is to help compile a list of troublesome ROMs. Once the software companies know that a particular ROM isn't happy with others, the onus is on them to sort out the problem.

You can help

What we're proposing is a chart of conflicting ROM software. Write in and report any ROMs you're having trouble with – send your comments to: Simon Williams, ROM Compatibility, *Acorn User*, 141-143 Drury Lane, London WC2B 5TF. This doesn't mean having a dig at a product which doesn't do what you imagined it would, but rather providing details of clashes you've come across in your machine. It takes two to conflict so you should have isolated the offenders before writing to us.

What we'll need to compile a list is:
● Basic specification of your machine: make, type and version of any DFS.
● Make, version and amount of any extra memory (shadow or sideways).
● Make and type of any second processor.
● Make and type of any peripherals attached when the conflict occurs.
● Make and version of any other ROMs in your machine (other than those below).
● Make and version of the two ROMs you think are causing the conflict.
● Nature of the conflict (eg, machine crashes with a row of asterisks in the middle of the screen). Is there an initial letter you can use to avoid conflict?
● Response of the software company, if you've reported the trouble (eg, 'We're working on it' or 'It's fixed in version 7.23').
● Any fix you've discovered to resolve the conflict in question.

The more help you can give us in reporting troubles you've had with conflicting software, the sooner we can help other users and the software companies to reduce the problem.

To kick off our compatibility quest we're presenting a list of ROMs and what Acorn micro's they're compatible with on the yellow pages. You'll also find an embryonic chart of conflicting ROMs – we want you to supply more details – and a table of prefix characters used by ROMs – see yellow pages 119 to 120

COMPETITION
ENTER THE GREAT PI RACE
We challenge you to calculate pi the fastest – and win one of three Kaga Taxan KP810 printers

Tony Quinn

The idea of this month's competition is quite simple (in theory at least!). What we want you to do is to calculate the value of that great constant pi! Of course, its value has yet to be set definitely as it is one of those numbers that goes on and on . . . to as many decimal places as you care to choose. What we want you to do is calculate the value rounded up to 500 decimal places accurately, and print out the value of each place on the screen as it is calculated, in the shortest possible time.

The idea came from Peter Corlett. He and James Tout had written a program in assembler that calculated pi to 500 decimal places in less than a minute. The rules are:

● Your program must use one of the recognised standard series (see box) for calculating the correct value of pi rounded up to 500 decimal places as given in figure 1.

● All calculations must be done within the program. No values can be read in. Entries which simply divide one number by another will not be allowed.

● Each place must be displayed on the screen as it is calculated.

● The time taken must be displayed on the screen when the program has finished.

● All programs must be written in mode 6.

● No DATA statements are allowed.

● The programs must be written legally, so no poking the screen or using routines in the Basic or MOS, other than those documented by Acorn, ie, OS calls.

● Programs cannot use sideways RAM or shadow memory on any machine.

● The program must be your own work and

```
3.14159265358979323846264338327950288419716
9399375105820974944592307816406286208998628034
825342117067982148086513282306647093844609550
5822317253594081284811174502841027019385211
05559644622948954930381964428810975665933446
12847564823378678316527120190914564856692346
0348610454326648213393607260249141273724587
00660631558817488152092096282925409171536436
78925903600113305305488204665213841469519415
1160943305727036575959195309218611738193261
1793105118548074462379962749567351885752724891
22793818301194913
```
Figure 1. The correct value of pi rounded up to 500 decimal places – calculate this as fast as possible

not have been commercially published. Copyright on all entries is with the author.

There are three groups for entries, and the winner in each group will receive a Kaga Taxan KP810 dot matrix printer with a retail price of £229.

1 Programs written in Basic. These can be written on an Electron, BBC B/B+ or Master and will be tested on a standard Master in our offices. The program must be written legally. Timing must be done with Basic's TIME function to one-hundredth of a second.

2 Programs written in Basic/assembler on Electron, BBC models B, B+ and B+128. You must use your own timing loop with the system clock using OSWORD calls 1 and 2. Machine code must be assembled in the main user memory, ie, above &E00.

3 Programs written in Basic/assembler on a Master 128. Group 2 rules apply.

Entries must be submitted on disc or cas-

sette and will be tested on our standard machines in each case. The programs must be written for standard machines without extra hardware such as second processors. Your entry must include the machine it was written on, whether it is in Basic or assembler, and the time (rounded up to the nearest second) marked on the envelope in the top left hand corner. For example: BBC B/Basic/300sec.

Entries which do not have this information on the envelope will be disqualified.

In the case of a tie, the winning entry will be decided by the best suggestion for a competition in *Acorn User*.

We regret that entries cannot be returned, and no correspondence or phone calls will be answered. Winners will be notified by post and their names printed in the September issue.

Send your entries to: *Acorn User*, Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF. Closing date is May 19 1986.

---

1 Leibnitz' formula (1674):
$$\pi = 4\left(1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \ldots\right)$$

2 Another version of Leibnitz:
$$\pi = 2 + 16\left(\frac{1}{1*3*5} + \frac{1}{5*7*9} + \frac{1}{9*11*13} + \ldots\right)$$

3 Machin's formula (1706):
$$\pi = 16*\arctan\left(\frac{1}{5}\right) - 4*\arctan\left(\frac{1}{239}\right)$$

where $\arctan(x) = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \frac{x^9}{9} - \ldots$

(Reference: *Problems for Computer Solution* by Gruenberger and Jaffray, published by John Wiley and Sons, currently out of print but you should find it in your local library)

The three standard ways of calculating pi

NAME

ADDRESS

TELEPHONE

MY ENTRY IS WRITTEN IN BASIC/ASSEMBLER*

MY TIME IN SECONDS IS

MY MICRO IS

MY SUGGESTION FOR A FUTURE COMPETITION IS

*Please delete as applicable
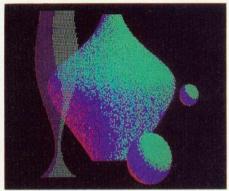
Kaga Taxan KP810 – we've got three to be won

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LISTINGS

INDEX / COMPATIBILITY

I N D E X

Program		Page	BBC B	BBC B+/128k	BBC ADFS	Shadow RAM	Electron	Electron with Plus 1	Electron with Plus 3 and Plus 1	Master 128	Master 128 with ADFS	6502SP	Econet	Monthly disc/tape
First Byte	Listing 1(a)	105	●	●	●	●	●		●	●	●	●	●	●
Tube Extensions	Listing 1	106										●	●	●
	Listing 2	108										●	●	●
	Listing 3	109										●	●	●
DIY Dumping	Listing 1(b)	110	●	●	●	●	●	●	●	●	●	●	●	●
	Listing 2(b)	111	●	●	●	●	●	●	●	●	●	●	●	●
	Listing 3(b)	111	●	●	●	●	●	●	●	●	●	●	●	●
	Listing 4(b)	112	●	●	●	●	●	●	●	●	●	●	●	●
	Listing 5(b)	113	●	●	●	●	●	●	●	●	●	●	●	●
Mandelbrot Set	Listing 1	114	●	●	●	●	●	●	●	●	●	●	●	●
	Listing 2	114	●	●	●	●	●	●	●	●	●	●	●	●
	Listing 3	115	●	●	●	●	●	●	●	●	●	●	●	●
Crabb	Listing 1		●	●	●				●	●		●	●	●

(a) requires disc   *(b) requires printer*

Entering listings

Where possible, programs are listed with line numbers in increments of 10 so type AUTO <RETURN> for automatic line numbering before you start. Don't type a space after the line number. To list your program so it appears identical to the printed version in the magazine, type:

LISTO 1<RETURN> WIDTH 40 <RETURN> LIST <RETURN>

With screen modes 1,4,6 or 7, WIDTH 40 is not needed. Occasionally, for clarity, programs are listed with a text width different to 40 characters.

Typing errors in Basic will usually cause error messages when the program is run. Finding errors in assembly language listings can be harder so we provide small, checking routines (called 'checksums') where possible.

All the Yellow Pages listings will work with Basic 1, 2 and 4 (unless stated otherwise) and with operating system OS1.2 or later operating systems.

Great care is taken to ensure the listings printed are correct but turn to Blunder box (page 17) to check if any errors were made in the previous issue.

First Byte, see page 54

Listing 1. A tape-to-disc transfer program. NB: this listing is dumped with WIDTH = 41

```
   10 REM Tape-to-disc transfer program
   20 REM by Tessie Revivis
   30 REM for B/B+/M/E
   40 REM (c) Acorn User May 1986
   50 :
   60 MODE 7
   70 space%=(HIMEM-TOP-512) AND &FF00
   80 DIM oscli% 40, mem% space%
   90 PROCcentre(2,"Tape-to-disc transfer
")
  100 PROCcentre(5,"Rewind your tape to t
he start,")
  110 PROCcentre(7,"press PLAY on your ta
pe machine")
  120 PROCcentre(9,"then press any key.")
  130 *FX 15
  140 *MOTOR 1
  150 any=GET
  160 CLS
  170 PROCcentre(2,"Transferring programs
now...")
  180 VDU 28,0,8,39,6
  190 ON ERROR PROCerror:END
  200 REPEAT
  210 CLS
  220 *TAPE
  230 *OPT 1,2
  240 PROCoscli("LOAD """" "+STR$~mem%)
  250 i$=""
```

Continued ▶

◀ Continued

```
  260 PRINTTAB(0,1);
  270 FOR char=0 TO 39
  280 i$=i$+CHR$(FNreadchar)
  290 VDU 32
  300 NEXT char
  310 *DISC
  320 PROCoscli("SAVE "+LEFT$(i$,7)+" "+S
TR$~mem%+" "+MID$(i$,15,4))
  330 UNTIL FALSE
  340 :
  350 DEF FNreadchar
  360 A%=135:X%=0:Y%=0
  370 =(USR(&FFF4) AND &FF00)/256
  380 :
  390 DEF PROCoscli($oscli%)
  400 X%=oscli%:Y%=oscli% DIV 256
  410 CALL &FFF7
  420 ENDPROC
  430 :
  440 DEF PROCcentre(y,t$)
  450 PRINTTAB(20-LENt$/2,y)t$
  460 ENDPROC
  470 :
  480 DEF PROCerror
  490 *DISC
  500 *OPT
  510 VDU 26,12
  520 PROCcentre(2,"Transfer aborted")
  530 IF ERR<>17 PRINTTAB(10,10);:REPORT:
PRINT" at line ";ERL
  540 ENDPROC
```

YELLOW PAGES
U T I L I T I E S

How to enter It's Quicker by Tube

Martin Chaplin presents three listings in this month's yellow pages. Listings 1 and 2 assemble two machine code routines; one to sit in the second processor and the other to live in the input/output processor on the main board. Listing 3 tests the extended facilities provided by listings 1 and 2.

Listing 1 assembles the code intended for the second processor. Make sure that you are using HiBasic when running this listing. Because listing 1 contains a lot of assembly language a checksum routine has been included (lines 2330 to 2370). Any errors found will be reported with a message prompting you to check your listing. The assembled code is saved at line 2380 with the filename M.X__HIBAS.

If you have made a typing error while entering listing 1 then ensure that after you have corrected your mistakes you save the new version. Before running listing 1 again you should press the Break key and either type OLD <Return> or load the corrected version back in.

Listing 2 assembles the machine code routine which lives in the main BBC micro. It can be run using Basic 2 or HiBasic. Again, a checksum routine has been included (lines 1460 to 1500) to detect any typing errors made. The finished code is saved with the filename M.IOTUBE at line 1510.

To implement the enhanced version of HiBasic, the following steps should be taken:
1. *Reset machine by pressing CTRL-Break.*
2. *Load HiBasic if it is not resident in the machine.*
3. *Check that HiBasic is operating correctly by typing:*
   PRINT ~ HIMEM
The value printed should be &B800.
4. *Set up the BBC micro end by typing:*
   *RUN M.IOTUBE
5. *Set up the second processor end by typing:*
   *RUN M.X__HIBAS

The extended facilities are now available for use. You can now enter listing 3 to test the extended HiBasic. Note, though, that listing 3 makes use of the new keyword 'TUBE' and so must only be entered once extended HiBasic has been installed. Running listing 3 will take you through a demonstration of the new commands.

Points to watch

Net or ADFS users should note that directories 'A' and 'M' are used and these should be created using *CDIR beforehand to avoid a 'not found' error.

The code M.IOTUBE should not be *RUN more than once without pressing the Break key, since it intercepts the OSBYTE vector.

Listing 1. A program to set up the second processor at both ends of the Tube

```
  10 REM Tube Extensions - 6502SP end
  20 REM by Martin Chaplin
  30 REM for BBC B/B+ with 6502SP
  40 REM (c) Acorn User May 1986
  50 :
  60 REM Run in 2nd processor using
  70 REM HIBASIC
  80 :
  90 HIMEM=HIMEM-&10F
 100 PROCconstants
 110 PROCassemble
 120 PROCsave
 130 END
 140 :
 150 DEF PROCconstants
 160 tubestatus=&FEFA
 170 tubedata=&FEFB
 180 buffer=&50
 190 direction=buffer
 200 motherboard=buffer+1
 210 osbytecode=buffer+3
 220 transferbytes=buffer+4
 230 reason=buffer+6
 240 satellite=buffer+7
 250 offset=&A
 260 pointer=&B
 270 lowbyte=&2A
 280 highbyte=&2B
 290 thirdbyte=&2C
 300 evaluate=&C043
 310 coldstart=&C2F8
 320 nextbyte=&C2B6
 330 hibasic=&C3B3
 340 ENDPROC
 350 :
 360 DEF PROCassemble
 370 FOR pass=0 TO 3 STEP 3
 380 P%=HIMEM
 390 COPT pass
 400 .tokenspace
 410 LDA #&EC
 420 STA &203
 430 CLI
 440 JMP coldstart
 450 .action
 460 INY
 470 LDA (pointer),Y
 480 CMP #&A5
 490 BEQ tubeget
 500 CMP #ASC("G")
 510 BEQ tubeget
 520 CMP #ASC("P")
 530 BNE tuberror
 540 LDA #&FF
 550 BNE always
 560 .tubeget
 570 LDA #0
 580 .always
 590 STA direction
 600 .discard
 610 INY
 620 LDA (pointer),Y
 630 CMP #ASC("A")
 640 BCS discard
 650 .next
 660 STY offset
 670 JSR evaluate
 680 LDA lowbyte
 690 STA motherboard
```

Continued ►

YELLOW PAGES

UTILITIES

```
 700 LDA highbyte
 710 STA motherboard+1
 720 JSR nextbyte
 730 CMP #ASC(",")
 740 BEQ comma
 750 .tuberror
 760 BRK
 770 EQUB &60
 780 EQUB &CE
 790 EQUB &20
 800 EQUB &85
 810 BRK
 820 .comma
 830 JSR evaluate
 840 LDA lowbyte
 850 STA satellite
 860 LDA highbyte
 870 STA satellite+1
 880 JSR nextbyte
 890 CMP #ASC(",")
 900 BNE tuberror
 910 JSR evaluate
 920 LDA lowbyte
 930 STA transferbytes
 940 LDA highbyte
 950 STA transferbytes+1
 960 .standalone
 970 LDA #&A4
 980 STA osbytecode
 990 LDY #6
1000 STY reason
1010 .sendparams
1020 LDA buffer,Y
1030 .wait
1040 BIT tubestatus
1050 BVC wait
1060 STA tubedata
1070 DEY
1080 BPL sendparams
1090 LDA direction
1100 BPL get
1110 .put
1120 LDY #0
1130 LDX transferbytes+1
1140 BEQ lp
1150 .hiloop
1160 LDA (satellite),Y
1170 .waitagain
1180 BIT tubestatus
1190 BVC waitagain
1200 STA tubedata
1210 INY
1220 BNE hiloop
1230 INC satellite+1
1240 DEX
1250 BNE hiloop
1260 .lp
1270 LDX transferbytes
1280 BEQ out
1290 .loop
1300 LDA (satellite),Y
1310 .waitrep
1320 BIT tubestatus
1330 BVC waitrep
1340 STA tubedata
1350 INY
1360 CPY transferbytes
1370 BNE loop
1380 .out
1390 JMP hibasic
1400 .get
```

```
1410 LDY #0
1420 LDX transferbytes+1
1430 BEQ lop
1440 .hilooprep
1450 BIT tubestatus
1460 BPL hilooprep
1470 LDA tubedata
1480 STA (satellite),Y
1490 INY
1500 BNE hilooprep
1510 INC satellite+1
1520 DEX
1530 BNE hilooprep
1540 .lop
1550 LDX transferbytes
1560 BEQ out
1570 .lopp
1580 BIT tubestatus
1590 BPL lopp
1600 LDA tubedata
1610 STA (satellite),Y
1620 INY
1630 CPY transferbytes
1640 BNE lopp
1650 BEQ out
1660 .call
1670 PHA
1680 PHP
1690 LDA thirdbyte
1700 CMP #&FF
1710 BEQ newcall
1720 PLP
1730 PLA
1740 JMP (lowbyte)
1750 .newcall
1760 LDA #6
1770 JSR send
1780 TYA
1790 JSR send
1800 TXA
1810 JSR send
1820 LDA #&A4
1830 JSR send
1840 LDA highbyte
1850 JSR send
1860 LDA lowbyte
1870 JSR send
1880 LDA #1
1890 JSR send
1900 PLA
1910 JSR send
1920 PLA
1930 .send
1940 BIT tubestatus
1950 BVC send
1960 STA tubedata
1970 RTS
1980 ]
1990 NEXT pass
2000 FOR X%=&B871 TO &BB31
2010 X%?-6=?X%
2020 NEXT X%
2030 ?&C210=&6B
2040 ?&ED19=&6B
2050 ?&BBB4=action MOD 256
2060 ?&BC26=action DIV 256
2070 ?&C3C9=&CE
2080 FOR pass=0 TO 3 STEP 3
2090 P%=&BB2C
2100 [OPT pass
2110 EQUS"TUBE"
```

YELLOW PAGES
UTILITIES

◀ **Chaplin's listing 1 continued**

```
2120 EQUB &CE
2130 EQUB &2
2140 ]
2150 P%=&B868
2160 [OPT pass
2170 JMP tokenspace
2180 ]
2190 P%=&C746
2200 [OPT pass
2210 JMP call
2220 ]
2230 P%=&B823
2240 [OPT pass
2250 NOP
2260 LDX #HIMEM MOD 256
2270 LDY #HIMEM DIV 256
2280 ]
2290 NEXT pass
2300 ENDPROC
2310 :
2320 DEF PROCsave
2330 LOCAL sum%
2340 FOR X%=HIMEM TO &F7FF STEP4
2350 sum%=sum%+!X%
2360 NEXT X%
2370 IF sum%<>&A5B5F2CD PRINT"Check for
possible assembly error"
2380 OSCLI"SAVE M.X_HIBAS "+STR$~HIMEM+
" F800 B800"
2390 ENDPROC
```

Listing 2. A program to set up the BBC at both ends of the Tube

```
10 REM Tube Extensions - BBC end
20 REM by Martin Chaplin
30 REM for BBC B/B+ with 6502SP
40 REM (c) Acorn User May 1986
50 :
60 REM Run in 6502 2nd processor
70 REM using BASIC2 or HIBASIC
80 :
90 PROCconstants
100 PROCassemble
110 PROCsave
120 END
130 :
140 DEF PROCconstants
150 start%=&1F00
160 tubestatus=&FEE2
170 tubedata=&FEE3
180 romid=&F4
190 latch=&FE30
200 buffer=&60
210 direction=buffer
220 motherboard=buffer+1
230 bytestransfer=buffer+3
240 bytev=&20A
250 ENDPROC
260 :
270 DEF PROCassemble
280 FOR pass=0 TO 3 STEP 3
290 P%=start%
300 [OPT pass
310 LDA bytev
320 STA oldbytev+1
330 LDA bytev+1
```

Continued ▶

◀ **Continued**

```
340 STA oldbytev+2
350 LDA #tube MOD 256
360 STA bytev
370 LDA #tube DIV 256
380 STA bytev+1
390 RTS
400 .fxout
410 CPX #1
420 BNE outfx
430 STY romid
440 STY latch
450 .outfx
460 LDA #130
470 .oldbytev
480 JMP &0000
490 .tube
500 CMP #&A4
510 BNE oldbytev
520 STY bytestransfer
530 STX bytestransfer+1
540 BIT tubestatus
550 BPL fxout
560 PLA
570 PLA
580 LDA #0
590 PHA
600 LDA #&36
610 PHA
620 LDX #2
630 .receive
640 BIT tubestatus
650 BPL receive
660 LDA tubedata
670 STA buffer,X
680 DEX
690 BPL receive
700 LDA direction
710 BEQ get
720 BPL call
730 .put
740 LDY #0
750 LDX bytestransfer+1
760 BEQ loloop
770 .hiloop
780 BIT tubestatus
790 BPL hiloop
800 LDA tubedata
810 STA (motherboard),Y
820 INY
830 BNE hiloop
840 INC motherboard+1
850 DEX
860 BNE hiloop
870 .loloop
880 LDX bytestransfer
890 BEQ out
900 .loop
910 BIT tubestatus
920 BPL loop
930 LDA tubedata
940 STA (motherboard),Y
950 INY
960 CPY bytestransfer
970 BNE loop
980 .out
990 RTS
1000 .get LDY#0
1010 LDX bytestransfer+1
1020 BEQ lolp
```

Continued ▶

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◄ **Chaplin's listing 2 continued**

```
1030 .hilp
1040 LDA (motherboard),Y
1050 .send
1060 BIT tubestatus
1070 BVC send
1080 STA tubedata
1090 INY
1100 BNE hilp
1110 INC motherboard+1
1120 DEX
1130 BNE hilp
1140 .lolp
1150 LDX bytestransfer
1160 BEQ out
1170 .lolop
1180 LDA (motherboard),Y
1190 .sending
1200 BIT tubestatus
1210 BVC sending
1220 STA tubedata
1230 INY
1240 CPY bytestransfer
1250 BNE lolop
1260 RTS
1270 .call
1280 LDX buffer+3
1290 LDY buffer+4
1300 .rec
1310 BIT tubestatus
1320 BPL rec
1330 LDA tubedata
1340 PHA
1350 PLP
1360 .gather
1370 BIT tubestatus
1380 BPL gather
1390 LDA tubedata
1400 JMP (motherboard)
1410 ]
1420 NEXT pass
1430 ENDPROC
1440 :
1450 DEF PROCsave
1460 LOCAL sum%
1470 FOR X%=start% TO P%-1
1480 sum%=sum%+?X%
1490 NEXT X%
1500 IF sum%<>&6BA6 PRINT"Check for pos
ible assembly error"
1510 OSCLI"SAVE M.IOTUBE "+STR$~start%+
" "+STR$~P%+" FFFF"+STR$~start%+" FFFF"+
STR$~start%
1520 ENDPROC
```

Listing 3. A test for both listings 1 and 2

```
10 REM Tube Extensions Test
20 REM by Martin Chaplin
30 REM for BBC B/B+ with 6502SP
40 REM (c) Acorn User May 1986
50 :
60 REM Runs in 6502 2nd processeor
70 :
80 ON ERROR GOTO 1180
90 MODE 1
100 COLOUR 2
110 PRINT"Please wait"
```

Continued ►

◄ **Continued**

```
120 FOR X%=&6200 TO &B1FF STEP 4
130 !X%=&A5A5A5A5
140 NEXT X%
150 PRINT"Test new FX call, *FX164,";
160 PRINT" which checks"
170 PRINT"that the TUBE software is";
180 PRINT" at the other"
190 PRINT"end of the TUBE"
200 GCOL 0,129
210 VDU 24,150;200;1130;750;
220 CLG
230 *FX 164
240 PRINT"*FX164 OK"
250 PROCpause
260 TUBEGET &3000,&1200,&5000
270 TUBEPUT &3000,&6200,&5000
280 PRINT'"TUBEGET &3000,&1200,&5000"
290 PRINT"Gets &5000 bytes from";
300 PRINT" Input/Output"
310 PRINT"motherboard and puts";
320 PRINT" them from &1200 to"
330 PRINT"&6200 in the 2nd processor"
340 PRINT'"TUBEPUT &3000,&6200,&5000"
350 PRINT"Puts &5000 bytes from";
360 PRINT" 2nd processor at"
370 PRINT"&6200-&B200 into screen";
380 PRINT" memory (&3000-"
390 PRINT"&8000) in motherboard"
400 PROCpause
410 CLS
420 PRINT"More code"
430 FOR X%=0 TO 3 STEP 3
440 P%=&2800
450 [OPT X%
460 LDA #0
470 STA &2870
480 LDA #&29
490 STA &2871
500 JMP (&2870)
510 ]
520 P%=&2900
530 [OPT X%
540 STA &1900
550 STX &1901
560 STY &1902
570 PHP
580 PLA
590 STA &1903
600 RTS
610 ]
620 NEXT
630 PROCpause
640 CLS
650 PRINT"CALL&2800"
660 PRINT"Checks out code"
670 PRINT'"If OK it is followed by :"
680 PRINT"TUBEPUT &2800,&2800,&5800"
690 CALL &2800
700 PROCpause
710 TUBEPUT &2800,&2800,&5800
720 REM Ensure no program at &2900
730 ?&2900=0
740 PROCpause
750 CLS
760 PRINT'"Check CALL extension"
770 PRINT"A%=1:X%=2:Y%=3:C%=0:";
780 PRINT"CALL &FF2900"
790 A%=1
800 X%=2
```

Continued ►

◄ Chaplin's listing 3 continued
```
     810 Y%=3
     820 C%=0
     830 CALL &FF2900
     840 PROCpause
     850 PRINTTAB(0,5)"&1900 holds";
     860 PRINT" the A register"
     870 PRINT"&1902 holds the Y register"
     880 PRINT"&1903 holds the P register"
     890 PRINT'"~!&1900 in 2nd Proc";
     900 PRINT" = &";~!&1900
     910 TUBEGET&1900,&1900,&4
     920 PRINT"~!&1900 in IO Proc";
     930 PRINT"  = &";~!&1900
     940 A%=2
     950 X%=3
     960 Y%=1
     970 C%=&FF
     980 CALL &FF2900
     990 PRINT"A%=2:X%=3:Y%=1:C%=&FF:";
    1000 PRINT"CALL &FF2900 AGAIN"
    1010 TUBEGET &1900,&1900,&4
    1020 PRINT"New ~!&1900 in IO Proc";
    1030 PRINT" = &";~!&1900
    1040 PROCpause
    1050 TUBE
    1060 PRINTTAB(3,20)"Test completed";
    1070 PRINT" successfully"
    1080 END
    1090 :
    1100 DEF PROCpause
    1110 PRINTTAB(0,31)"Press a key";
    1120 PRINT" to continue";
    1130 REPEAT UNTIL GET
    1140 PRINTTAB(0,31)STRING$(23," ");
    1150 ENDPROC
    1160 :
    1170 REM Check error in Line 1050
    1180 IF (ERR=&60) AND (ERL=1050) PRINTT
AB(0,16);:REPORT:PRINT":-Error message t
ested OK":GOTO 1060
    1190 CLS
    1200 PRINTTAB(5,5)"Test error"'''
    1210 REPORT
    1220 PRINT" @ Line No. ";ERL
    1230 END
```

How to enter DIY Dumping

All five programs are straightforward. As the assembler in each is short a checksum has not been included. With the exception of the 'HtoV' listing all programs require an Epson or Epson compatible dot-matrix printer to work. Electron owners will obviously need to have the Plus 1 attached to be able to use a printer.

The CDUMP program is numbered from line 10000 onwards. This is deliberate as it is not a stand alone program but instead a procedure that can be spooled onto the end of a main program. After entering CDUMP save it as an ASCII spool file thus:

*SPOOL CDUMP

LIST

*SPOOL

The program will list to tape or disc.

The program 'SPLSCRN' tests CDUMP. Enter and save SPLSCRN. CDUMP can be appended to the end of SPLSCRN by performing,

*EXEC CDUMP.

To use CDUMP you will need to insert an extra line at the point where you wish the character dump to take place. In the case of SPLSCRN place it as follows:

75 PROCcdump

Listing 1. Single characters are prompted from the screen and are printed out using their definitions

```
      10 REM CHARPRT
      20 REM by George Hill
      30 REM B/B+/M/E with Plus 1
      40 REM (C) Acorn User May 1986
      50 :
      60 MODE 6
      70 ON ERROR PROCerror:END
      80 :
      90 PROCinitialise
     100 REPEAT
     110 PROCgetchar
     120 CALL code
     130 PROCprintit
     140 UNTIL FALSE
     150 END
     160 :
     170 DEF PROCinitialise
     180 DIM code 47
     190 osword=&FFF1
     200 VDU 23,240,1,3,7,15,31,63,127,255
     210 VDU 23,241,1,3,5,9,31,33,65,129
     220 PROCassemble
     230 VDU 2
     240 ENDPROC
     250 :
     260 DEF PROCassemble
     270 FOR pass=0 TO 2 STEP 2
     280 P%=code
     290 [OPT pass
     300 .code
     310 LDA #&0A
     320 LDX #char MOD 256
     330 LDY #char DIV 256
     340 JSR osword
     350 :
     360 .htov
     370 LDY #7
     380 .loop1
     390 LDX #7
     400 .loop2
     410 LDA cchar,Y
     420 LSR A
     430 STA cchar,Y
     440 ROR pchar,X
     450 DEX
     460 BPL loop2
     470 DEY
     480 BPL loop1
     490 RTS
     500 ]
     510 char=P%
     520 cchar=P%+1
     530 pchar=P%+9
     540 NEXT
     550 ENDPROC
     560 :
     570 DEF PROCgetchar
     580 INPUT"Type a character, or an ASCI
I code:"char$
     590 ch=ASC(LEFT$(char$,1))
     600 IF LEN(char$)>1 AND ch>47 AND ch<5
9 THEN ch=VAL(char$)
     610 ?char=ch
     620 ENDPROC
     630 :
     640 DEF PROCprintit
     650 VDU 1,27,1,75,1,8,1,0
     660 FOR index=0 TO 7
```

Continued ►

YELLOW PAGES
P R I N T E R S

◀ Hill's listing 1 continued

```
    670 VDU 1,pchar?index
    680 NEXT
    690 VDU 1,10
    700 ENDPROC
    710 :
    720 DEF PROCerror
    730 FOR N%=0 TO 40
    740 VDU 1,127
    750 NEXT
    760 VDU 1,27,1,64,3,10,13
    770 IF ERR<>17 THEN REPORT:PRINT" at l
ine ";ERL
    780 ENDPROC
```

Listing 2. It reads a character and reproduces it exactly

```
    10 REM TYPWRTR
    20 REM by George Hill
    30 REM B/B+/M/E with Plus 1
    40 REM (C) Acorn User May 1986
    50 REM PAGE=PAGE+&600
    60 :
    70 MODE 3
    80 PROCinitialise
    90 PRINT SPC(20);CHR$(240);" George's
 Typewriter Program ";CHR$(241)''
   100 REPEAT
   110 ?char=GET
   120 IF ?char=13 THEN VDU 13:PROCprint1
ine ELSE VDU?char
   130 IF POS=79 THEN VDU 7,8
   140 UNTIL FALSE
   150 END
   160 :
   170 DEF PROCinitialise
   180 P$="The value of PAGE is too low t
o permit you to redefine the normal char
acters."+CHR$(10)+CHR$(13)+"Reset PAGE,
then reload program."
   190 DIM code 107
   200 oswrch=&FFEE
   210 osbyte=&FFF4
   220 osword=&FFF1
   230 REM Check filing system
   240 osargs=&FFDA
   250 A%=0:X%=&70:Y%=0
   260 F%=USRosargs MOD 256
   270 IF (F%=1 OR F%=2 OR F%=3) AND PAGE
<(&E00+&600) THEN PRINT P$:STOP
   280 IF F%=4 AND PAGE<(&1900+&600) THEN
 PRINT P$:STOP
   290 IF (F%=5 OR F%=6) AND PAGE<(&1200+
&600) THEN PRINT P$:STOP
   300 *FX20,6
   310 PROCdefinechars
   320 REM Initialise printer
   330 VDU 2,1,27,1,64,3
   340 PROCassemble
   350 ENDPROC
   360 :
   370 DEF PROCprintline
   380 VDU 2,1,27,1,76,1,128,1,2
   390 FOR N%=1 TO 80
   400 CALL code
   410 VDU 3,9,2
   420 NEXT
   430 VDU 1,10,3
```
Continued ▶

◀ Continued

```
   440 ENDPROC
   450 :
   460 DEF PROCassemble
   470 FOR pass=0 TO 2 STEP 2
   480 P%=code
   490 [OPT pass
   500 .code
   510 \read character
   520 LDA #135
   530 JSR osbyte
   540 STX char
   550 LDA #&0A
   560 LDX #char MOD 256
   570 LDY #char DIV 256
   580 JSR osword
   590 .htov
   600 LDY #7
   610 .loop1
   620 LDX #7
   630 .loop2
   640 LDA cchar,Y
   650 LSR A
   660 STA cchar,Y
   670 ROR pchar,X
   680 DEX
   690 BPL loop2
   700 DEY
   710 BPL loop1
   720 \print character
   730 LDX #0
   740 .loop3
   750 LDA #1
   760 JSR oswrch
   770 LDA pchar,X
   780 JSR oswrch
   790 INX
   800 CPX #8
   810 BNE loop3
   820 RTS
   830 ]
   840 char=P%
   850 cchar=P%+1
   860 pchar=P%+9
   870 NEXT
   880 ENDPROC
   890 :
   900 DEF PROCdefinechars
   910 REM Redefine what you like here.
   920 VDU 23,240,1,3,7,15,31,63,127,255
   930 VDU 23,241,&80,&C0,&E0,&F0,&F8,&FC
,&FE,&FF
   940 VDU 23,65,1,5,9,17,63,65,129,0
   950 ENDPROC
```

Listing 3. Dumping procedure to let you print user-defined characters when dumping a screen one character at a time

```
 10000 REM CDUMP
 10010 REM by George Hill
 10020 REM B/B+/M/E with Plus 1
 10030 REM (C) Acorn User May 1986
 10040 REM Must be merged with a
 10050 REM dumping program - see notes
 10060 :
 10070 DEF PROCcdump
 10080 DIM code 48
```
Continued ▶

ACORN USER MAY 1986

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◀ Hill's listing 3 continued

```
10090 osword=&FFF1
10100 osbyte=&FFF4
10110 PROCassemble
10120 PROCreadparameters
10130 PROCdump
10140 ENDPROC
10150 :
10160 DEF PROCassemble
10170 FOR pass=0 TO 2 STEP 2
10180 P%=code
10190 [OPT pass
10200 .code
10210 LDA #&0A
10220 LDX #char MOD 256
10230 LDY #char DIV 256
10240 JSR osword
10250 :
10260 .htov
10270 LDY #7
10280 .loop1
10290 LDX #7
10300 .loop2
10310 LDA cchar,Y
10320 LSR A
10330 STA cchar,Y
10340 ROR pchar,X
10350 DEX
10360 BPL loop2
10370 DEY
10380 BPL loop1
10390 RTS
10400 ]
10410 user=P%
10420 char=P%+1
10430 cchar=P%+2
10440 pchar=P%+10
10450 NEXT
10460 ENDPROC
10470 :
10480 DEF PROCdump
10490 VDU 26,2
10500 VDU 1,27,1,65,1,linefeed
10510 FOR Y%=1 TO linesperpage
10520 VDU 1,27,1,density,1,n1,1,n2
10530 FOR X%=1 TO charsperline
10540 !user=USR osbyte
10550 CALL code
10560 FOR N%=0 TO 7
10570 VDU 1,N%?pchar
10580 IF twofive THEN VDU 1,N%?pchar
10590 NEXT
10600 VDU 3,9,2
10610 NEXT
10620 VDU 1,10
10630 NEXT
10640 VDU 1,12,1,27,1,64,3
10650 ENDPROC
10660 :
10670 DEF PROCreadparameters
10680 A%=135
10690 !user=USR osbyte
10700 mode=user?2
10710 RESTORE 10800
10720 FOR N%=0 TO mode
10730 READ linefeed,linesperpage,charspe
rline,density,n1,n2,twofive
10740 NEXT
10750 ENDPROC
10760 :
```

Continued ▶

◀ Continued

```
10770 REM DATA contains 7 parameters,
10780 REM one line per Mode.
10790 :
10800 DATA 8,32,80,76,128,2,0
10810 DATA 8,32,40,75,64,1,0
10820 DATA 8,32,20,75,64,1,-1
10830 DATA 10,25,80,76,128,2,0
10840 DATA 8,32,40,75,64,1,0
10850 DATA 8,32,20,75,64,1,-1
10860 DATA 10,25,40,64,1,0
10870 DATA 10,25,40,75,64,1,0
```

Listing 4. Sample-screen for dumping with CDUMP

```
   10 REM SPLSCRN - to test CDUMP
   20 REM by George Hill
   30 REM B/B+/M/E with Plus 1
   40 REM (C) Acorn User May 1986
   50 :
   60 PROCinitialise
   70 PROCsample
   80 END
   90 :
  100 DEF PROCinitialise
  110 DIM scruser 3
  120 osbyte=&FFF4
  130 PROCread
  140 VDU 26,12
  150 ENDPROC
  160 :
  170 DEF PROCsample
  180 VDU 23,240,1,3,7,15,31,63,127,255
  190 VDU 23,241,&80,&C0,&E0,&F0,&F8,&FC,
&FE,&FF
  200 VDU 23,242,255,129,129,129,129,129,
129,255
  210 VDU 23,243,1,3,5,9,17,33,65,129,255
  220 VDU 23,244,1,1,1,1,1,1,1,1
  230 VDU 23,245,128,128,128,128,128,128,
128,128
  240 VDU 23,246,8,28,28,107,127,107,8,28
  250 VDU 23,247,8,28,62,127,62,28,8,0
  260 VDU 23,248,54,127,127,127,62,28,8,0
  270 VDU 23,249,8,28,62,127,127,127,28,6
2
  280 PRINTTAB(charsperline/2-8,0);CHR$(2
40);"SAMPLE SCREEN";CHR$(241)
  290 FOR N%=1 TO linesperpage-2
  300 PRINT CHR$(244);CHR$(32);
  310 FOR J%=0 TO charsperline DIV 2-4
  320 PRINT CHR$(32);CHR$(246+J% MOD 4);
  330 NEXT
  340 PRINT CHR$(32);CHR$(32);CHR$(245)
  350 NEXT
  360 PRINTTAB(charsperline/2-8,linesperp
age-1);"BOTTOM LINE";CHR$(242);CHR$(243);
  370 ENDPROC
  380 :
  390 DEF PROCread
  400 A%=135
  410 !scruser=USR osbyte
  420 mode=scruser?2
  430 RESTORE 490
  440 FOR N%=0 TO mode
  450 READ linefeed,linesperpage,charsper
       line,density,n1,n2,twofive
```

Continued ▶

YELLOW PAGES
P R I N T E R S

```
460 NEXT
470 ENDPROC
480 :
490 DATA 8,32,80,76,128,2,0
500 DATA 8,32,40,75,64,1,0
510 DATA 8,32,20,75,64,1,-1
520 DATA 10,25,80,76,128,2,0
530 DATA 8,32,40,75,64,1,0
540 DATA 8,32,20,75,64,1,-1
550 DATA 10,25,40,75,64,1,0
560 DATA 10,25,40,75,64,1,0
```

Listing 5. Illustrates how the bit-by-bit conversion is carried out

```
 10 REM HtoV
 20 REM by George Hill
 30 REM B/B+/M/E
 40 REM (C) Acorn User May 1986
 50 :
 60 MODE 1
 70 VDU 23,1,0;0;0;0;
 80 PROCconstants
 90 PROCheadings
100 PROCgrids
110 PROCdisplays
120 PROCspin
130 VDU 17,3,31,0,31,23,1,1;0;0;0;
140 END
150 :
160 DEF PROCconstants
170 delay%=1000
180 null$="Z"
190 A1X=3:A1Y=2
200 A2X=23:A2Y=13
210 ACX=23:ACY=2
220 G1X=32*A1X-16
230 G1Y=32*(32-A1Y)-496
240 G2X=32*A2X-16
250 G2Y=32*(32-A2Y)-496
260 GCX=32*ACX-16
270 GCY=32*(32-ACY)-48
280 DIM bit1$(7,7),bit2$(7,7)
290 DIM hpos(7,7),vpos(7,7)
300 FOR N%=0 TO 7
310 FOR J%=0 TO 7
320 bit1$(N%,J%)=STR$(RND(2)-1)
330 bit2$(N%,J%)=null$
340 hpos(N%,J%)=2*J%
350 vpos(N%,J%)=2*N%
360 NEXT
370 NEXT
380 carry$=null$
390 ENDPROC
400 :
410 DEF PROCgrids
420 PROCgrid(G1X,G1Y,FALSE)
430 PROCgrid(G2X,G2Y,TRUE)
440 ENDPROC
450 :
460 DEF PROCdisplays
470 COLOUR 2
480 PROCdisplayarray(A1X,A1Y,FALSE)
490 PROCdisplayarray(A2X,A2Y,TRUE)
500 PROCcarry(GCX,GCY)
510 ENDPROC
```

```
520 :
530 DEF PROCgrid(XL,YL,two)
540 LOCAL m,n
550 IF two THEN m=21:n=5 ELSE m=5:n=21
560 XH=XL+32*16
570 YH=YL+32*16
580 FOR X=XL TO XH STEP 64
590 MOVE X,YL
600 PLOT n,X,YH
610 NEXT
620 FOR Y=YL TO YH STEP 64
630 MOVE XL,Y
640 PLOT m,XH,Y
650 NEXT
660 ENDPROC
670 :
680 DEF PROCdisplayarray(XL,YL,array)
690 FOR N%=0 TO 7
700 FOR J%=0 TO 7
710 PRINTTAB(hpos(N%,J%)+XL,vpos(N%,J%
)+YL);
720 IF array THEN PRINTbit2$(N%,J%); E
LSE PRINTbit1$(N%,J%);
730 NEXT
740 NEXT
750 ENDPROC
760 :
770 DEF PROCcarry(X,Y)
780 MOVE X,Y
790 DRAW X+64,Y
800 DRAW X+64,Y+64
810 DRAW X,Y+64
820 DRAW X,Y
830 PRINTTAB(ACX,ACY);carry$;
840 ENDPROC
850 :
860 DEFPROCspin
870 Z%=INKEY(delay%)
880 FOR N%=7 TO 0 STEP -1
890 H1X=G1X+64*8+4
891 H1Y=G1Y+32
900 H2X=G2X+64*8-32
901 H2Y=G2Y+64*8+64
910 GCOL 0,0
920 MOVE H1X,H1Y+64*(6-N%)
930 DRAW H1X+60,H1Y+64*(6-N%)
940 DRAW H1X+60,GCY+32
950 GCOL 0,3
960 MOVE H1X,H1Y+64*(7-N%)
970 DRAW H1X+60,H1Y+64*(7-N%)
980 DRAW H1X+60,GCY+32
990 DRAW GCX,GCY+32
1000 MOVE GCX+64,GCY+32
1010 DRAW H2X,GCY+32
1020 DRAW H2X,H2Y
1030 FOR J%=0 TO 7
1040 lastJ=(J%+7) MOD 8
1050 Z%=INKEY(delay%)
1060 *FX15
1070 GCOL0,0
1080 MOVE H2X,H2Y
1081 DRAW H2X-64*8,H2Y
1090 PROCarrow(G2X+32+64*lastJ,G2Y+32*1
8)
1100 GCOL 0,3
1110 MOVE H2X,H2Y
1120 DRAW H2X-64*(7-J%),H2Y
1130 PROCarrow(G2X+32+64*J%,G2Y+32*18)
1140 carry$=bit1$(N%,7)
```

```
      1150 FOR K%=0 TO 6
      1160 bit1$(N%,7-K%)=bit1$(N%,6-K%)
      1170 NEXT
      1180 bit1$(N%,0)=null$
      1190 FOR K%=0 TO 7
      1200 PRINTTAB(hpos(N%,K%)+A1X,vpos(N%,K
      %)+A1Y);bit1$(N%,K%);
      1210 NEXT
      1220 PRINTTAB(ACX,ACY);carry$;
      1230 Z%=INKEY(delay%)
      1240 *FX15
      1250 FOR K%=0 TO 6
      1260 bit2$(7-K%,J%)=bit2$(6-K%,J%)
      1270 NEXT
      1280 bit2$(0,J%)=carry$
      1290 carry$=null$
      1300 FOR K%=0 TO 7
      1310 PRINTTAB(hpos(K%,J%)+A2X,vpos(K%,J
      %)+A2Y);bit2$(K%,J%);
      1320 NEXT
      1330 PRINTTAB(ACX,ACY);carry$;
      1340 NEXT
      1350 NEXT
      1360 ENDPROC
      1370 :
      1380 DEF PROCheadings
      1390 COLOUR 1
      1400 PRINTTAB(A1X,A1Y-2);"Character Byt
      es";
      1410 PRINTTAB(A2X+1,A2Y+18);"Printer By
      tes";
      1420 PRINTTAB(ACX-2,ACY-2);"Carry"TAB(A
      CX-1,ACY+2);"bit";
      1430 FOR N%=0 TO 7
      1440 PRINTTAB(A2X+2*N%,A2Y+16);7-N%;
      1450 PRINTTAB(A1X-2,A1Y+N%*2);N%;
      1460 NEXT
      1470 ENDPROC
      1480 :
      1490 DEF PROCarrow(X,Y)
      1500 MOVE X,Y
      1510 DRAW X,Y-60
      1520 DRAW X-8,Y-52
      1521 MOVE X+8,Y-52
      1522 DRAW X,Y-60
      1530 ENDPROC
```

Join the Mandelbrot Set, see page 80

Listing 2. Generates Mandelbrot graphics

```
      10 REM MANDEL1
      20 REM by David Johnson-Davies
      30 REM B/B+/M/E
      40 REM (C) Acorn User May 1986
      50 :
      60 maxcol%=7
      70 MODE 2
      80 S%=255
      90 DIM C%(S%)
      100 VDU 28,16,31,19,0
      110 INPUT "x,y:" j,k
      120 INPUT "  s:" q
      130 var=maxcol%/LOG(S%)
      140 FOR N%=1TO S%
      150 C%(N%)=maxcol%-INT(LOG(N%)*var)
      160 NEXT
```

```
      170 VDU 19,1,5;0;
      180 VDU 19,2,4;0;
      190 VDU 19,3,6;0;
      200 VDU 19,4,2;0;
      210 VDU 19,5,3;0;
      220 VDU 19,6,1;0;
      230 :
      240 REM Main Loop
      250 Q%=1024: M%=1
      260 REPEAT
      270 L=q/M%
      280 H%=Q%/M%
      290 FOR J%=0 TO M%-1
      300 FOR K%=0 TO M%-1
      310 IF K% MOD 2 OR J% MOD 2 PROCpt
      320 NEXT:NEXT
      330 M%=M%*2
      340 PRINT M%
      350 UNTIL M%=256
      360 PRINT "END"
      370 END
      380 :
      390 DEF FNm(u,v)
      400 N%=-1:x=0:y=0
      410 REPEAT
      420 y2=y*y
      430 x2=x*x
      440 y=2*x*y+v
      450 x=x2-y2+u
      460 N%=N%+1
      470 UNTIL N%=S% OR x2+y2>=4
      480 =N%
      490 :
      500 DEF PROCpt
      510 x=j+L*J%
      520 y=k+L*K%
      530 PROCgcol(C%(FNm(x,y)))
      540 X%=J%*H%
      550 Y%=K%*H%
      560 MOVE X%,Y%
      570 MOVE X%+H%-1,Y%
      580 PLOT 85,X%,Y%+H%-1
      590 PLOT 85,X%+H%-1,Y%+H%-1
      600 ENDPROC
      610 :
      620 DEF PROCgcol(B%)
      630 GCOL 0,B%
      640 ENDPROC
      650 :
      660 DEF PROCgcol(B%)
      670 D%=B% DIV 2
      680 E%=(D%+B% MOD 2) MOD 8
      690 VDU 23,12,D%,E%,E%,D%,D%,E%,E%,D%
      700 GCOL 16,0
      710 ENDPROC
```

Listing 3. Creates a 4k disc file of Mandelbrot graphics data

```
      10 REM MANDEL2
      20 REM by David Johnson-Davies
      30 REM B/B+/M/E
      40 REM (C) Acorn User May 1986
      50 :
      60 INPUT"File:"A$
      70 file=OPENOUT A$
      80 INPUT "x,y:" j,k
      90 INPUT "  s:" Q%
      100 S%=255
```

◀ Johnson-Davis's listing 3 continued

```
   110 H=Q%/128
   120 FOR J%=0 TO 127
   130 FOR K%=0 TO 127
   140 u=j+H*J%
   150 v=k+H*K%
   160 N%=-1:x=0:y=0
   170 REPEAT
   180 y2=y*y
   190 x2=x*x
   200 y=2*x*y+v
   210 x=x2-y2+u
   220 N%=N%+1
   230 UNTIL N%=S% OR x2+y2>=4
   240 BPUT #file,N%
   250 NEXT
   260 PRINT J%
   270 NEXT
   280 CLOSE#file
   290 PRINT "END"
   300 END
```

Listing 4. Reads the data file created by listing 3, processes the point and plots the result

```
    10 REM MANDEL3
    20 REM by David Johnson-Davies
    30 REM B/B+/M/E
    40 REM (C) Acorn User May 1986
    50 :
    60 maxcol%=7
    70 DIM C%(255)
    80 FOR N%=0 TO 255
    90 C%(N%)=0
   100 NEXT
   110 :
   120 INPUT"File:"A$
   130 file=OPENIN A$
   140 FOR N%=1TO 128*128
   150 B%=BGET#file
   160 C%(B%)=C%(B%)+1
   170 NEXT
   180 :
   190 max=(128*128-C%(255))/maxcol%
   200 C%(255)=0
   210 J%=maxcol%
   220 T%=0
   230 FOR N%=0 TO 254
   240 T%=T%+C%(N%)
   250 C%(N%)=J%
   260 IF T%>=max*(maxcol%-J%+1) J%=J%-1:
IF J%<1 J%=1
   270 NEXT
   280 :
   290 REM Plot Points
   300 MODE 2
   310 VDU 28,16,31,19,0
   320 VDU 19,1,5;0;
   330 VDU 19,2,4;0;
   340 VDU 19,3,6;0;
   350 VDU 19,4,2;0;
   360 VDU 19,5,3;0;
   370 VDU 19,6,1;0;
   380 H%=8
   390 PTR#file=0
   400 FOR J%=0 TO 127
   410 FOR K%=0 TO 127
   420 B%=C%(BGET#file)
```

Continued ▶

◀ Continued

```
   430 PROCgcol(B%)
   440 X%=J%*H%
   450 Y%=K%*H%
   460 MOVE X%,Y%
   470 PLOT 1,0,H%-1
   480 NEXT
   490 NEXT
   500 END
   510 :
   520 DEF PROCgcol(B%)
   530 GCOL 0,B%
   540 ENDPROC
   550 :
   560 DEF PROCgcol(B%)
   570 D%=B% DIV 2
   580 E%=(D%+B% MOD 2) MOD 8
   590 VDU 23,12,D%,E%,E%,D%,D%,E%,E%,D%
   600 GCOL 16,0
   610 ENDPROC
```

Checksums

David Johnson-Davies listings 1 and 2 (Mandel 1 and 2) provides this month's checksums. Numerous variables are used in the programs so it is possible that you could enter one of these incorrectly thus inhibiting the program's action. If you cannot trace the error 'manually' then use the checksum. You will need the BSUM program provided in First Byte of August 1985 or use the *CHECK command present on the Acorn User *UserROM (see page 102).*

Mandel 1 checksum

Line	Checksum
10	771
20	2460
30	752
40	2006
50	63
60	810
70	324
80	347
90	571
100	929
110	980
120	728
130	1511
140	834
150	2105
160	242
170	748
180	748
190	751
200	748
210	750
220	749
230	63
240	1122
250	709
260	250
270	421
280	461
290	952
300	953
310	1699

Continued ▶

by Alan Crabb

Mandel 2 checksum

Line	Checksum	Line	Checksum
10	772	200	731
20	2460	210	740
30	752	220	394
40	2006	230	1358
50	63	240	869
60	857	250	242
70	797	260	392
80	980	270	242
90	734	280	678
100	347	290	567
110	465	300	229
120	897		
130	898		
140	564		
150	567		
160	862		
170	250		
180	526		
190	523		

Electron Keys

Entering Basic programs on the Electron can be a much quicker process because of its single key entry facility. By pressing a combination of keys a corresponding Basic keyword is entered onto the screen and into your program. This program by Alan Crabb allows Beeb users to emulate this useful Electron facility.

There are 29 keywords in all and the keywords on the keys are exactly the same as for the Electron, so anyone using both the BBC and the Eletron can still use the single keyword entry on the BBC.

With the utility installed using the single entry is simple. Ensure that caps lock is engaged (the caps lock light should be illuminated), press CTRL and the key on which relates to the keyword needed. To get the usual CTRL effect simply disengage caps lock and the keys have their normal effect (ie, CTRL – U deletes present line).

*The routine may be turned off using *CODE 0 0 and re-engaged using *CODE 0 1. To get rid of it permanently type *FX 247 < Return > then press Break. A list of the keys and the keywords they produce is given in figure 1.*

*The routine works by intercepting the Operating System ReaD CHaracter routine (OSRDCH). It decodes the value for the character read and if caps lock is engaged, CTRL pressed and the key legitimate, the routine inserts the keyword and Return if OLD or RUN into the keyword buffer. The routine intercepts Break using *FX 247 and re-initialises itself.*

How to enter Electron Keys

The program can be entered in the normal way. Save the source program before attempting to run it. Correct any errors that may occur. Take care to enter the keyword data exactly as shown, and all on a single line. The program incorporates a checksum routine that will check that your machine code is correct. All being well you will see the message 'Electron Keys' displayed.

The program assembles from &900 and also requires space in page &A. This area is normally used by the cassette filing system, serial port and sound buffers. If you need to use any of these facilities the machine code will need to be assembled elsewhere. In such cases the checksum will be incorrect.

Listing 1. The program enables Beeb users to emulate an Electon facility

```
 10 REM Electron Keys
 20 REM by Alan Crabb
 30 REM B/B+/M
 40 REM (C) Acorn User May 1986
 50 :
 60 start=&900
 70 readv=&210
 80 uservec=&200
 90 osbyte=&FFF4
100 oswrch=&FFEE
110 osrdch=&FFE0
```

Figure 1 — Electron Keys! See Top of the List

The keyboard diagram shows the following keys and their associated functions:

Key	Function
Q	LOCAL
W	RESTOR
E	ELSE
R	RUN*
T	THEN
Y	REPEAT
U	UNTIL
I	INPUT
O	OLD*
P	PLOT
A	AUTO
S	STEP
D	DRAW
F	FOR
G	GOTO
H	DEG
J	RAD
K	CHAIN
L	LIST
Z	END
X	PROC
C	COLOUR
V	VDU
B	RENUM
N	NEXT
M	MODE
<	LOAD
>	SAVE
?	PRINT

```
120 PROCassemble
130 PROCdata
140 PROCchecksum
150 PROCstart
160 END
170 :
180 DEF PROCassemble
190 FOR pass=0 TO 3 STEP 3
200 P%=start
210 [OPT pass
220 PHP
230 BCC end
240 LDA readv
250 STA rdch+1
260 LDA readv+1
270 STA rdch+2
280 LDA #rdch MOD 256
290 STA readv
300 LDA #rdch DIV 256
310 STA readv+1
320 LDA uservec
330 STA userV
340 LDA uservec+1
350 STA userV+1
360 LDA #user MOD 256
370 STA uservec
380 LDA #user DIV 256
390 STA uservec+1
400 JSR mess
410 .end
420 LDA breakV+1
430 BPL more
440 PLP
450 RTS
460 :
470 .more
480 PLP
490 JMP (breakV)
500 :
510 .mess
520 LDX #li MOD 256
530 .ploop
540 LDA title,X
550 JSR oswrch
560 DEX
570 BPL ploop
580 RTS
590 :
600 .user
610 CMP #0
620 BNE notcode
630 CPX #0
640 BNE notcode
650 CPY #0
660 BNE on
670 LDA rdch+1
680 STA readv
690 LDA rdch+2
700 STA readv+1
710 RTS
720 :
730 .on
740 LDA #rdch MOD 256
750 STA readv
760 LDA #rdch DIV 256
770 STA readv+1
780 JMP mess
790 :
800 .notcode
810 JMP (userV)
```

◀ **Crabb's listing 1 continued**

```
 820 :
 830 .rdch
 840 JSR osrdch
 850 BCS escape
 860 STA &70
 870 TYA
 880 PHA
 890 TXA
 900 PHA
 910 LDA #&CA
 920 LDY #&FF
 930 LDX #0
 940 JSR osbyte
 950 TXA
 960 AND #&50
 970 CMP #&40
 980 BEQ capslock
 990 .return
1000 PLA
1010 TAX
1020 PLA
1030 TAY
1040 LDA &70
1050 CLC
1060 .escape
1070 RTS
1080 :
1090 .fin
1100 LDA #0
1110 STA &70
1120 BEQ return
1130 .capslock
1140 LDA &70
1150 CMP #&1B
1160 BCC letter
1170 SEC
1180 SBC #&10
1190 CMP #&1C
1200 BCC return
1210 CMP #&20
1220 BCS return
1230 .letter
1240 STA &70
1250 CMP #13
1260 BNE word
1270 LDA #&81
1280 LDX #&9A
1290 LDY #&FF
1300 JSR osbyte
1310 CPY #0
1320 BEQ return
1330 .word
1340 LDY &70
1350 LDA datastore,Y
1360 TAY
1370 LDX #0
1380 .loop
1390 LDA words,Y
1400 CMP #124
1410 BEQ fin
1420 STY &71
1430 TAY
1440 LDA #&8A
1450 JSR osbyte
1460 LDY &71
1470 INY
1480 BNE loop
1490 ]
1500 breakV=P%
1510 P%=P%+2
```

Continued ▶

◀ **Continued**

```
1520 userV=P%
1530 P%=P%+2
1540 title=P%
1550 $title=CHR$13+CHR$10+CHR$10+"syeK
nortcelE"
1560 li=LEN $(title+1)
1570 P%=P%+li+1
1580 datastore=P%
1590 P%=P%+&20
1600 words=P%
1610 NEXT
1620 ENDPROC
1630 :
1640 DEF PROCdata
1650 FOR N%=0 TO &1F
1660 READ offset
1670 N%?datastore=offset
1680 NEXT
1690 READ word$
1700 FOR N%=0 TO LEN word$-1
1710 letter=ASC MID$(word$,N%+1,1)
1720 IF letter=42 THEN letter=13
1730 N%?words=letter
1740 NEXT
1750 P%=P%+LEN(word$)
1760 DATA 0,1,6,15,22,27,32,36,41,45,51
,55
1770 DATA 61,66,71,76,81,86,92,97,102,1
07
1780 DATA 113,117,125,130,137,0,141,0,1
46,151
1790 DATA :AUTO:RENUMBER:COLOUR:DRAW:EL
SE:FOR:GOTO:DEG:INPUT:RAD:CHAIN:LIST:MOD
E:NEXT:OLD*:PLOT:LOCAL:RUN*:STEP:THEN:UN
TIL:VDU:RESTORE:PROC:REPEAT:END:LOAD:SAV
E:PRINT:
1800 ENDPROC
1810 :
1820 DEF PROCstart
1830 ?(breakV+1)=&80
1840 C%=1
1850 CALL start
1860 A%=&F7
1870 X%=0:Y%=&FF
1880 IF FNbyte<>&4C GOTO 1950
1890 A%=A%+1
1900 X%=0:Y%=&FF
1910 ?(breakV+0)=FNbyte
1920 A%=A%+1
1930 X%=0:Y%=&FF
1940 ?(breakV+1)=FNbyte
1950 *FX 247,76
1960 A%=&F8
1970 X%=start MOD 256
1980 CALL osbyte
1990 A%=A%+1
2000 X%=start DIV 256
2010 CALL osbyte
2020 ENDPROC
2030 :
2040 DEF FNbyte
2050 =((USR osbyte) AND &FF00) DIV &100
2060 :
2070 DEF PROCchecksum
2080 J%=0
2090 FOR L%=&900 TO &AAB
2100 J%=J%+?L%
2110 NEXT
2120 IF J%=41590 THEN ENDPROC
2130 PRINT "Checksum error!"
2140 STOP
```

YELLOW PAGES
ROM COMPATIBILITY QUEST

Languages	Model B	6502 SP	ADFS	B+/128	Master	Electron	Elec+1	Elec+1 +3	ROM incompatibility
Basic 1	Y	N	N	N	N	N	N	N	
Basic 2	Y	Y	Y	Y	N	Y	Y	Y	
Basic 4	N	N	Y	N	Y	N	N	N	
BCPL	Y	Y	Y	Y	Y	Y	Y	Y	
Comal	Y	Y	Y	Y	Y	Y	Y	Y	
Acorn Forth	Y	Y	Y	Y	Y	Y	Y	Y	
Lisp	Y	Y	Y	Y	Y	Y	Y	Y	
Acorn Logo	Y	Y	Y	Y	Y	Y	Y	Y	
Logotron Logo	Y								
Open Logo	Y	Y	N	Y	N	N	N	N	
ISO Pascal	Y	Y	Y	Y	Y	YC	YC	YC	Wordwise Plus over use of *FX163
Oxford Pascal	Y								
Prolog	Y	Y	Y	Y	Y	Y	Y	Y	
Editors									
Altra BASed	Y								
Acorn BASed	Y								
Edword	Y								
InterWord	Y								
Pro-Word	Y	Y							
Scribe	Y	N							
View 1.4	Y	Y	Y	P					Ultracalc
View 2.1	Y	Y	Y	P		YC	YC	YC	
View 3.0	Y	Y	Y	Y	YS				
Wordwise	Y	P							
Wordwise Plus	Y	Y							
Spreadsheets									
InterSheet	Y								
Ultracalc 2	Y	Y	Y	Y	Y	Y	Y	Y	
ViewSheet	Y	Y	Y	Y	YS	YC	YC	YC	
Databases									
DataGem	Y		Y	Y					CC Graphics ROM
Interbase	Y								
StarBase II	Y	Y							
System Delta	Y			Y	Y				CC Graphics ROM (turn off with *FX162,255)
ViewStore	Y	Y	Y	Y	Y				
Utilities									
Accelerator	Y								
Acorn GXR	Y				YS				
Addcomm									Wordwise Plus. Use ?&3A5=0/ ?&3A5=128 to turn on/off
Addpack	Y		Y						
ADE	Y								Wordwise Plus over use of *FX163
ADT	Y								
AMX Art	Y								
AMX Superart	Y								
Beebmon	Y								
BROM	Y			Y					ROM manager (shouldn't need both!)
BROM+	Y			Y					Disc Doctor (shouldn't need both!)
Caretaker	Y								v1.0 Any Rom which uses TAB key
Communicator	Y								
Commstar	Y				N				
Crossware Asm	Y								

The Great Acorn User ROM Compatibility Quest has begun (see page 96)! Here is the start of a ROM compatibility chart that we want you, the reader, to fill in. Let us know of any clashes, no matter how small, that you have encountered. Also, if you know that a certain ROM is incompatible with another then we want to know. Everyone who supplies some information we can use will get a name check in Acorn User.

In addition we want to hear about any prefix characters used by a ROM so that we can build up a table. In addition we're interested in any *FX calls used by any ROM, other than those described by Acorn.

Simon Williams will be co-ordinating your details so send them to him care of the AU office and mark your letter 'ROM Compatibility'.

This month we're carrying two charts. The first (left) deals with machine compatibility and lists which ROMs will work with which of the Acorn micros, followed by details of any ROM incompatibilities we know of. In some instances a 'fix' is provided! Finally, chart two (page 120) lists letters that commands may be prefixed with to ensure that a particular command reaches the ROM in question.

We propose that ROM commands should be prefixed with the company's intials. In future all AU firmware will allow the use of *AU as a prefix. This avoids use of one prefix character by several suppliers.

So help us to help you – we look forward to hearing from you!

Send entries to: Simon Williams, ROM Compatibility, c/o Acorn User, 141-143 Drury Lane, London WC2B 5TF.

	Model B	6502 SP	ADFS	B+/128	Master	Electron	Elec+1	Elec+1 +3	ROM incompatibility
Disc Doctor	Y								
Discmaster	Y								
Dumpmaster	Y	Y		Y		N	N	N	
Dumpout 3	Y	Y							
Enigma	Y								
Exmon II	Y	N		P		N	N	N	
Floppy-Wise +	Y								
Fontaid	Y								
Fontwise	Y								
Graphics ROM	Y								
Gremlin	Y								
Help II	Y	Y		Y		Y	Y	Y	
Icon Master	Y	Y		Y		N	N	N	
InterChart	Y								
Investigator	Y								
Gemini LBO	Y		Y	Y		N	N	N	CC Graphics ROM
Macrom	Y		Y						
Mega-Rom	Y								
Meta Assm	Y								
BBC Monitor	Y	Y	Y	Y	Y	N	N	N	
Murom	Y	N		N		N	N	N	
NovaCAD	Y	Y		Y					
Pagemaker	Y	N	N	Y*					CC Speech ROM, Disc Doctor, Demon ZROMM, SPQR ROM
Printmaster	Y								
Probe	Y								
Prog Builder	Y								
Replay	Y	N							
Replica III	Y								
Rom Manager	Y	P							
Rom Master	Y								
ROM-Spell	Y	N							
Romas	Y	Y							
Romit	Y	P		Y		N	N	N	
Scythe	Y	P							
Slave	Y	P							
Slave +	Y								
Sleuth	Y	N		Y		N	N	N	
Acorn Speech	Y								
CC Speech	Y	Y							
Spellcheck	Y								
SpellcheckIII	Y	Y		Y		N	N	N	
SPY2	Y	P							
Starmon	Y	Y							
Studio Eight	Y								
Tango	Y			Y					
Termi	Y	P							
Termi II	Y	Y							
Toolkit Elect	N	N	N	N	N	Y	Y	Y	
Toolkit +	Y								
Toolstar	Y	P							
Transferom	Y	P							
Termulator	Y	Y			YS				
User Dump	Y	Y	Y	Y	Y	P	P	P	
User ROM	Y	NP	Y	Y	Y	YP	Y	Y	
VASM	Y	N							
ViewSpell	Y	Y							
Word-Aid	Y								
Wordease	Y	Y		Y		N	N	N	
3D Zicon	Y								

Key (blank) – Unknown, information would be welcome. Y – Yes, compatible, though may not use some features, such as shadow RAM. P – Partly compatible, most routines work. N – No, major incompatibility. S – Supplied with machine. C – Cartridge available. * – Shadow Mode off. CC – Computer concepts.

A – ADT, Altra
B – Beebugsoft
C –
D –
E –
F –
G –
H –
I –
J –
K –
L –
M –
N –
O –
P –
Q –
R –
S – Software Services
T –
U – Acorn User
V –
W –
X – AMX
Y –
Z – A&F, Clares
SD – Minerva

A: Chart 2. Letters to prefix commands with to ensure they reach the right ROM

Note
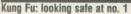
Quoted clashes are not 'blamed' on either party! Some clashes can be overcome by changing the priorities of ROMs.

CHARTS
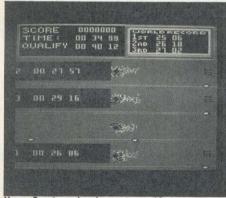
TOP 20 BBC MICRO GAMES
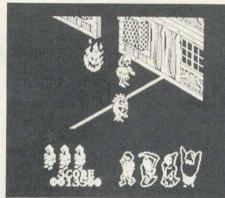
	Title	Publisher	Cassette	Disc	B+	Master	Reviewed
1 (1)	Yie Ar Kung Fu	Imagine	£9.95	£12.95	No	No	March '86
2 (2)	Way of the Exploding Fist	Melbourne House	£9.95	–	Yes*	Yes*	April '86
3 (9)	Citadel	Superior	£9.95	£11.95	Yes	*	March '86
4 (3)	Strike Force Harrier	Mirrorsoft	£9.99	£12.99	Yes	No	January '85
5 (4)	Repton 2	Superior	£9.95	£11.95	Yes	*	December '85
6 (7)	Computer Hits (10)	Beau Jolly	£9.95	–	Yes	No	–
7 (15)	Speech!	Superior	£9.95	£11.95	Yes	*	February '86
8 (5)	Night Shade	Ultimate	£9.95	–	*	*	May '86
9 (8)	Match Day	Ocean	£9.95	–	Yes	Yes	January '86
10 (–)	Hyper Sports	Imagine	–	£12.95	No	No	May '86
11 (10)	Gyroscope	Melbourne House	£8.95	£14.95	Yes	Yes	May '85
12 (6)	Dr Who and the Mines of Terror	Micro Power	£18.95	£19.95	No	No	March '86
13 (–)	Steve Davis Snooker	CDS	£8.95	£12.95	No	*	May '86
14 (19)	Phantom Combat	Doctor Soft	£9.95	£11.95	Yes	Yes	February '86
15 (16)	Combat Lynx	Durrell	£8.95	–	Yes	*	September '85
16 (–)	Spectipede	Mastertronic	£1.99	–	*	No	–
17 (11)	Revs	Acornsoft	£14.95	£17.65	Yes	Yes	July '85
18 (12)	Bullseye	Macsen	£8.95	–	*	*	–
19 (13)	Waterloo	Lothlorien	£9.95	£12.95	Yes	Yes	April '86
20 (14)	Elite	Acornsoft	£14.95	£17.65	Yes	No	October '84

Kung Fu: looking safe at no. 1
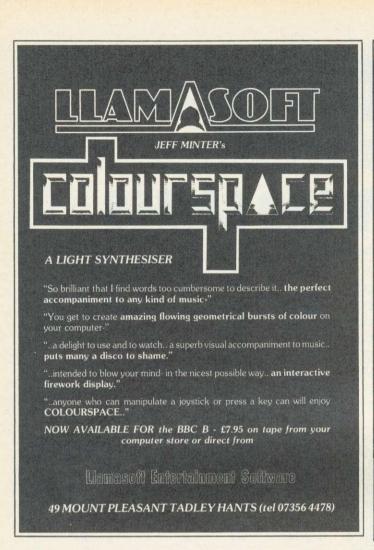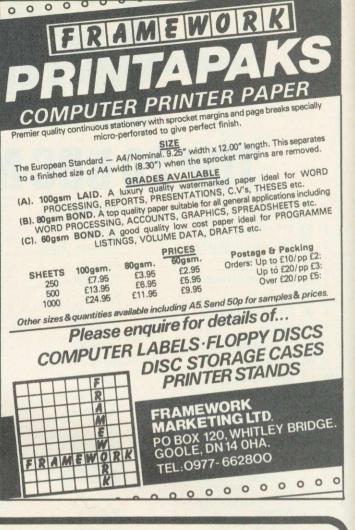
Hyper Sports: swimming up to no. 10

Night Shade: reviewed on page 125

TOP 10 ELECTRON GAMES

	Title	Publisher	Cassette	Disc	Reviewed
1 (2)	Yie Ar Kung Fu	Imagine	£8.95	–	March '86
2 (1)	Computer Hits (10)	Beau Jolly	£8.95		–
3 (3)	Beach Head	Access/US Gold	£8.95	–	December '85
4 (–)	Citadel	Superior	£9.95	–	March '86
5 (–)	Spectipede	Mastertronic	£1.99	–	–
6 (4)	Repton 2	Superior	£9.95	£11.95	December '85
7 (8)	Blockbusters	Macsen	£7.95	–	–
8 (10)	The Mine	Micro Power	–	£9.95	–
9 (–)	Stockcar	Micro Power	£6.95	–	–
10 (–)	Felix and the Fruit Monsters	Micro Power	£2.50	–	–

COMPILED BY GALLUP/MICROSCOPE   *PLEASE CHECK B+ MASTER COMPATIBILITY WITH SUPPLIER BEFORE BUYING

REVIEWS

GAMES

BARRELS OF FUN ON TAP

'Tapper', US Gold, BBC B, £9.95 (cassette or disc)

This arcade game is a barrel of laughs. Several barrels, in fact, because you play a frantic bartender whose job is to keep an ever-growing crowd of customers satisfied. They sidle into various parts of the bar and you have to leap around, filling glasses from the beer taps, slinging them along the bar, saloon-style, and collecting the empties they sling back at you. You lose a life if you keep a thirsty customer waiting too long.

(Actually, the instructions have been carefully edited for the benefit of under-age users, and would like us to believe that it's really a soda fountain and you're only serving fizzy pop. But that doesn't fool anyone.)

As you become proficient, you'll be promoted from the Wild West Saloon to the Jock Bar (patronised not by thirsty Scotsmen, thank goodness, but by sporty people in baseball caps), then to the Punk Bar, with its purple-haired customers, and finally to the Space Bar, full of creatures almost as weird as the punks. In between bars, you can pick up bonus points in an interlude with the 'Soda Bandit'. He shakes up cans of Budweiser – sorry, soda pop – then shuffles them around rapidly. You score by picking the one he hasn't shaken and opening it. If you guess wrong, you're sprayed. Either way, you're soon back in the bar with a hoard of impatient customers.

Sometimes, one of the customers is kind enough to leave you a tip.

If you can collect it without mishap, a pair of dancing girls start doing a can-can and most of
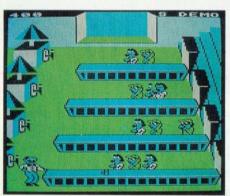
the punters stop drinking to watch – which gives you a breather. It's all good fun and very reminiscent of The Sun, the *Acorn User* local.

The instruction leaflet was obviously printed for an earlier version of the game, for another micro.

It suggests, for example, you can use a joystick on the BBC micro version, which you can't (although you can choose your own keys), and it talks about the two-player game, which also isn't available.

Never mind, it's easy enough to learn to play – but frustratingly difficult to play it well. It's an entertaining game with a high very addictiveness rating.   **Jeffery Pike**

MIXED SPORT

'Hyper Sports', Imagine, BBC B, £14.95 (disc only)

Four things are tested by Olympic games – the speed, and the endurance, of your hands at hammering the keyboard; reaction time to changing events on the screen (like rapidly increasing angles, etc); and accuracy (either by

hitting a target, or by doing something at a precise point such as a take-off line). The very best events are those which can challenge all four abilities and get you to co-ordinate them –

javelin-throwing is a good example. But for the newer games, new events are being introduced – and only a few successfully involve all the challenges of the best Olympic games.

The quality of the six individual events in *Hyper Sports* vary enormously.

By listening to the sound effects, the opening events – skeet shooting and swimming – can literally be played with your eyes closed. On the other hand, the archery offers an intriguing challenge (the wind speed and direction vary, so the event can be different each time you play). The triple jump provides a true test of co-ordinating speed, angle and timing. And the weightlifting is a good challenge to your finger muscles – if you can get that far in the game!

The problem is that the central event, gymnastics, operates on totally incomprehensible principles.

There just doesn't seem to be a 'method' you can master, so your results are completely unpredictable. It's enormously frustrating to fail at the gymnastics each time, and be sent back to the easy opening events, never reaching the later, better games.

And there is no 'practice' way of trying out the various events; you have to play in sequence every time.

In the end, I felt those frustrations and the easy, boring opening games outweighed the really entertaining events. There are three good events, two boring and one that's just plain duff – for me, that doesn't count as enough to be value for money.

Paul Keers

GAMES

SATISFYING SNOOKER

'Steve Davis Snooker', CDS Software, BBC B and B+, £8.95 (cassette), £12.95 (disc)

Here's your chance to play snooker against the Romford maestro, and even beat him. Steve 'Interesting' Davis apparently endorsed this program, and it must be said that it's a pretty accurate computer representation of the game.

The table is illustrated on screen in mode 2, with green cushions and a black playing surface'– which causes a few problems straight away, like how do you show the black ball? (Answer: a white circle, black inside. Similarly the brown is really green and red.) Also, mode 2 graphics only allow fairly rough-and-ready shapes: the balls are chunky crosses.

Before you start, you select the speed of the table (fast, normal or slow), decide whether to play against an opponent or the computer or yourself (good for practising), then, if you're playing the computer, elect just how good your opponent (S Davis Esq) is going to be, from 9 (unbeatable) to 1 (frankly pretty ropey). When it's your turn to pot, you use the keyboard to position a hairline cross exactly where you want to hit the target ball, to define the spin and pace of the cue ball, and to fire.

The results are generally much the same as when I play on a real table – balls rocketing everywhere, the occasional fluky pot, a foul stroke every now and again, and a very rare brilliant snooker. The computer keeps score and does everything else that nice man with the white gloves does, respotting the balls, calling the fouls, asking if you'd like your opponent to play again after a foul stroke, and so on.

The balls don't move round the table exactly like the real thing but, all things considered, the animation is fairly smooth. A bit of sound might help: surely it wouldn't slow things down too much to have a click when balls

collide? It's quite enjoyable to play, fairly frustrating (just like the real thing) and, believe me, immensely satisfying when you land Smug Davis in an unplayable snooker.

Jeffery Pike

LOADS OF CHALLENGES

'Gyroscope', Melbourne House, BBC B and Electron, £8.95 (cassette)

Every so often, you come across a piece of games software which you suspect was much more fun to write than it is to play and here's a case in point. You have to steer a spinning gyroscope across platforms and down ramps, into holes like those on bar billiards tables (hands up those who remember bar billiards). When you've achieved this, you get another screen, with more platforms and more ramps, leading to another hole. And then another one.

The programming is ever-so-clever. The screens look solidly three-dimensional and your gyroscope behaves just as a real one might if you had remote control over it – reacting slowly but surely to a twitch on the rudder (keys or joystick), rolling faster down the steep slopes than the gradual ones, trundling slowly uphill when necessary, and falling off the edge if you oversteer. John Nixon and David Wainwright are to be congratulated for some neat graphics, and a brilliant application of three-dimensional geometry and the law of gravity. But as for playing the game . . .

I just couldn't get excited about it. I couldn't see *why* I should want to steer a gyroscope into a hole, and thus I didn't care much one way or the other if I made it or not. I'm not sure what it is that's missing, but all the best computer games have some in-built compulsive element which makes you want to go on playing and doing better. This one, clever though it is, simply doesn't.

Jeffery Pike

THE SEQUEL'S SEQUEL

'Nightshade', Ultimate, BBC B £9.95 (cassette)

I enjoyed *Nightlore*, I really did. The advances Ultimate made with its 'filmation' technique were, at the time, amazing. *Alien 8* was more of the same. It was claimed it had a better plot, but it was generally felt to have less going for it. This latest offering changes the backdrops again, offers a few more nicely drawn nasties, but for all that is very much the same as its previous two adventure cartoons.

The cassette sleeve tells of a nightmarish village populated by ghouls and ghosties. All that can save the Kingdom is a weird little fellow in a habit. Guess who controls him?

The game uses the same 3D effects as before, with the interesting development that walls containing doorways vanish as you walk your hero through. It gives the game a more solid feel, and the buildings are very well drawn tudor-panelled affairs.

There's a motley assortment of meanies, some of them brainless and looking like escapees from a Maurice Sendak book, others with a nasty line in zapping you. You have a variety of different weapons (bacteria the blurb calls them), and most of these work on most of the baddies most of the time.

The colour schemes are pretty dull, using no stippling or other screen-enlivening effects, and sounds are few and far between.

The *Nightshade* cassette comes with a second bonus tape, containing a game rejoicing in the name of 'Head Cleaner'. This one has very poor graphics, no sound (except a peculiar rasping from the tape machine while it's loading), and precious little plot. Seriously, though, it's quite a fun package, but it's about time Ultimate came up with something new.

Simon Williams

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SOFTWARE

WITH A VIEW TO STORAGE

Alex van Someren delves into Acornsoft's database ROM and decides it's good value for money

ViewStore is the latest ROM offering from Acornsoft in its *View* family of loosely-connected business software for the BBC micro and Master series. Supplied as a 16k ROM, manual and utilities disc it supports DFS, ADFS and Econet filing systems, although its performance with the latter is decidedly uninspiring except when used with the presently-unreleased ANFS – I'll tell you more about that later.

ViewStore is a fairly sophisticated package, allowing the computer-literate user to set up a good environment for working with databases, and it's certainly one of the best for Acorn equipment currently on the market.

Configuring ViewStore

Like all general-purpose database systems *ViewStore* needs a significant amount of setting-up before data can be entered and the database put to work. After installing the ROM the user must configure *ViewStore* so it can find all the various files needed to run the database – it expects to find a database file, a format file (controlling the screen and data formats) and usually a number of index files. Each kind of file must be stored in a different directory, each named with an initial letter, eg, 'D' for the database files. The Prefix command establishes where the directories D, F and I (and others) are found on the current filing system, so for example, one might set the Prefix for the database files to be ":0." whereupon *ViewStore* will always search for a database file by trying to open "·.D.database-name". This arrangement is a little unnecessary when using hierarchical filing systems such as the ADFS or Econet, but can save a lot of bother when using ordinary floppy discs. In this way *ViewStore* manages to accommodate all Acorn filing systems and any number of disc drives with minimal preamble, though a boot file is definitely required!

Once you have set up the system using Prefix, *ViewStore* expects you to estimate and enter the amount of space needed by the database overall – the number of records you expect to have, the number of indexes, their

ViewStore's spreadsheet display mode

filenames, and the index key sizes – using the Setup utility supplied. This process shows how *ViewStore* suffers from Acorn's past mistakes: if, while answering Setup's questions about the expected size of the database, you fail to provide sufficiently over-estimated answers, the DFS will come up against 'Can't extend' errors. On the other hand the manual says that the system operates (ie, after setting up) more slowly with larger files, probably due to the indexing technique used. Since the only cure for such errors is to compact the disc, it appears DFS users will have to suffer slower systems until they upgrade to ADFS, where such problems do not occur.

Finally, before you start entering data, *ViewStore* wants you to tell it the names, types, sizes, constraints and prompts associated with each field of a record, along with a variety of optional information which depends on the specific kind of field. Data types available are alphanumeric, textual, numeric (eg, floating-point) and two date formats (English and American). Alpha and text types have a 'Scroll flag' which allows them to be larger than the available screen space. The distinction between these two types is abysmally glossed over in the manual, and proves to be quite important.

Numeric data has a decimal places control, and all types can have lower and upper limit constraints, eg, earliest date or highest letter of the alphabet. Each field can have a prompt, displayed at the top of the screen when the cursor is on that field, and you may also supply

a value list which restricts the data allowed to be entered into the field to entries in the list. There are also several options for indexing.

If this preparation process sounds daunting, then rest assured – it is! But, like most software, it soon becomes second nature and after creating five or six different databases I find the whole process takes about 15 minutes.

Once the formalities have been completed, *ViewStore* is ready for you to enter data onto the screen. *ViewStore* uses two screens in much the same way as *View* does, Escape toggling between them. The data screen can be in one of two formats, either 'spreadsheet' or 'card'. The former shows one record to a line, with fields arranged as columns, and scrolls sideways (almost) infinitely to accommodate fields that are not immediately visible. The latter permits you to layout fields in a pseudo-cardbox style, possibly more useful where you want to keep many fields visible at once. This layout must be designed with an unpleasantly simplistic editor which spoils the card display for me to the extent that I don't bother to use it.

ViewStore thinks very hard when you enter data, a fact exaggerated by the time lag between typing things into fields and them actually appearing on the screen. While the delay is not long in real terms, it is more than perceptible and therefore rather irritating. That aside, though, I'm delighted to say that entering data is simplicity itself. The use of a boot file saves time and tears at switch-on, but beyond that stage a child could do it!

Database usefulness

The ultimate usefulness of any database comes from its indexing capabilities, something which *ViewStore* is not short of. An index can be created for any field in a record, or for several at a time, depending on how they are created. You may use the Index utility to create a one-off index for a field whenever you wish, but when more data is added the index instantly becomes out of date. To overcome this *ViewStore* can maintain indexes on several fields at a time automatically, the exact number being determined by the filing system in use.

The DFS and NFS can maintain four indexes, while ADFS can support nine.

The speed (or rather sluggishness) of the system is directly in proportion to the number of indexes being updated, and with more than two the delays mentioned above become even more disturbing.

Records may be ordered on screen by means of any index (including out-of-date ones), allowing instant checks for duplications and gaps. The value of this facility should not be underestimated, as a corrupt database is a useless database!

Select utility

Once up-to-date indexes exist, *ViewStore* allows more sophisticated record selections using the Select utility. This allows you to generate either a printed list of a subset of the database, or to generate a new database containing that subset, thereby allowing further processing. All the utilities except Select and Setup can use such a file as their source data.

After a few preliminaries Select asks for the selection criteria, of which there can be any number. Each criterion must evaluate to a Boolean value (eg, NAME = "Alex", whose value here is TRUE), and the criteria may then be strung together using the Boolean operators AND and OR. To permit complex selections *ViewStore* allows the criteria to be entered over several lines, and multiple bracketing is permitted so the order of evaluation can be forced. Single and multiple character wildcards are allowed, and an option also exists to truncate the amount of a field used in a comparison.

When generating a file of selected data *ViewStore* also asks for the fields by which you wish the resulting records to be sorted. Again, there can be any number of sort fields, so long as 'the total number of characters used in the comparisons is not greater than 250,' whatever that means. The sorts can be performed in either ascending or descending order.

I found the Select utility very easy to use, though it is fairly poorly documented. The distinction between the alphanumeric and textual types is that in the former case the whole field is used in the comparison, whereas in the latter case each word in the field is compared individually. In this context *ViewStore* defines a word to be any number of characters bounded by spaces. I only discovered the three lines discussing this in the manual as I was writing the review, and this highlights the lack of a summary of the

selection commands, a serious omission in discussing an area which much of the system revolves around.

The 'select file' produced by the Select utility can be used by some other utilities to produce formatted output and link *ViewStore* with other members of the *View* family.

The Macro utility translates a select file into a series of *View* macro lines, one per record, which may then be read into *View* to provide data for labels, form letters, etc. Macro simply asks the user to enter the order in which the fields are wanted in the macro to be generated, and requests a name for the resulting file.

The Link utility performs a similar function for transferring data to *ViewSheet*. Again, you may specify which fields you wish to transfer and in which order, followed by a filename which is usually of the form "V.VSn" (n = 0-255) to be compatible with *ViewSheet*'s Read facility. The Link utility is not as comprehensive as Macro in that it can only transfer numeric fields, a little surprising knowing that *ViewSheet* accommodates labelling of rows and columns and that the field names are readily available from *ViewStore*.

No prizes for divining the purpose of the Labels utility, which is a short-cut to avoid using Macro and then having to go into *View*. The numerous options ensure that nearly every size and shape of continuous label stationery can be used, and a nice touch is the 'Alignment print' option, which allows you to make a mess of reams of labels in order to get them aligned before printing a full set. Anyone who has printed labels more than once or twice will understand what a good idea this is!

The fiendishly useful Import program is actually a chunk of Basic and machine code which converts foreign data formats into *ViewStore* databases. It requires a good deal of preparation before use, such as finding out how records are delimited in your source file and so forth. I have persuaded it to create databases out of everything from *View* macros (the opposite of Macro!) to corrupted ASCII text files. It asks you nearly 20 questions before it goes off to process your file, and I find it hard to imagine any format which it couldn't cope with. Several examples, dBaseII among them, are included in the manual. It's not fast but it's a blessing for anyone who is already using other database systems.

Finally, the Report utility is a simple pretty-printer which works in very much the same way as macros do in *View*, ie, fill in the blanks.

Headers, repeated on every page, are supported as are both textual and numeric blank-filling. Basic arithmetic is permitted, and two levels of registers are available for performing sub-totalisation. Using these registers *ViewStore* will print out sub-totals each time the value of a specified field changes, producing neatly formatted listings with totals in

A record-type definition menu

places one might instinctively put them – a very nice touch.

Conclusion

ViewStore is a fairly comprehensive database management system, and it fits loosely but tidily into the network of data transfers within the *View* family. It is certainly the most comprehensive database management system available for Acorn equipment that I have encountered, but it still has a long way to go before we can compare it with some systems for other machines – still, what can you expect for several hundred pounds less?

Using *ViewStore* on the Econet is a complete write-off unless you have ANFS or are using a file server from SJ Research. The reason for this is beyond the scope of this review, but it has to do with the history of the Econet software. I strongly suggest you try it out before you buy it for network use, particularly as Acorn currently has no information on when the ANFS will be released.

If you are lucky enough to have an ADFS disc system, either floppy or hard, *ViewStore* is very much easier to use. Using it with the DFS is a chore which should really be reserved for misers and masochists.

ViewStore is not fast, but if you trade this off against its sophistication I think you'll agree that it's excellent value for money.

REVIEWS

MAKE-UP FOR MORTALS

Tony Quinn relives the joys of working on newspapers in the first of two reviews of publishing software

Two names have been on everyone's lips for the past six months: Mirrorsoft's *Fleet Street Editor* and *Pagemaker* from Advanced Memory Systems (now in a 'Super' version which doesn't need the AMX Mouse chip). I'm going to deal with these in two parts, with *Fleet Street Editor* coming first and the AMS offering next month. They both have major failings which decry their ability to achieve their claims, but I have no doubt that they are a major step in software publishing, and it is yet another tribute to the quality of the BBC micro that they appear on it first.

Fleet Street calls to you through advertising pages with 'professional-looking printed materials' and the jargon of newspapers. AMS waxes just as lyrical with 'a revolutionary software program that will produce newspapers . . . to an extraordinary professional standard.' The adverts then go on to quote words like 'phenomenal' and 'outstanding' from an *Educational Computing* review.

So, after reviewing the hype, what are the programs really like? First, they are both restricted to an A4-size page (the size of this

magazine), and I'm still waiting for a paper from Murdoch, Shah, Maxwell (under whose wing Mirrorsoft lives), or anyone else which is that small. Next, they both suffer from appalling typefaces, the standard of which takes me back four years to the crude styles of early printers, because text has to be handled in the same way as graphics. This means neither can use the near letter quality (NLQ) typefaces of today's printers, which is a pity.

The set-up

Before you turn to the Advertising Standards Authority, let's go through the capabilities of *Fleet Street*. The software was written for Mirrorsoft by Clares, a company renowned for programming through its many utilities. The manual is an A5 ring binder with a folder containing two discs (which are a tight fit in a plastic wallet) and a function key strip neatly tucked into the back. This is a big advantage over *Pagemaker*, as you can literally put *Fleet Street* in your pocket. No ROMs are needed, and the program can be controlled from keyboard or joystick – but not from a mouse.

Figure 2. Result of using the 'guided tour' files. All the material except the 'Groucho' panel is provided. The banner is a 'stretched' panel

The manual is well-written, indexed, and full of diagrams, but it has some annoying characteristics. The first is a mass of pages on topics like newspaper and computer jargon and worthy but wordy chapters on the publishing process.

I don't think I'm alone in wanting to get to the nitty gritty, rather than skim through what I already know. Of course the package is complex and sophisticated, so you have to read something to get going, but it would be good to show people in a more obvious way which bits are and are not vital.

The numbering system for pages and paragraphs can be a bit confusing, but it's been done this way so that Mirrorsoft can send out new or corrected pages without having to renumber the whole manual.

The first thing to do is to tell the system disc what sort of computer set-up you have – printer, disc drives, etc. In doing so, you have to learn a new set of disc jargon because *Fleet Street* uses 'flippy discs' which you actually have to turn over. This might be confusing for less-experienced users, but Mirrorsoft assured me they had had no problems. I got my system set up wrong the first time, but it's not hard to

Figure 1. One page out of the 42 in the graphics library. I took the woman for the 'Stun' page, and loaded her into the Studio (figure 3). Here I added a background, changed her face and added the headline text

do it again. My advice to the uninitiated is to find someone to help you. You then prepare some 'user discs' with a very handy format and verify utility.

Once the system is set up properly, your best bet is to go through the 'guided tour' where most of the work is already done for you. You create one panel out of the eight which make up a page.

The guided tour

The tour introduces you to each of the five elements in the system: graphics library, studio, copydesk, page make-up and preview/print. It works like this: you enter the library (figure 1), select one of the 200-odd standard graphics (I chose Groucho) and save it to disc.

You then enter the studio, load in the saved graphic, play around with it by expanding the size (I doubled the height), and save it to disc. There are many other goodies in the studio, allowing pictures to be altered and even creating your own from scratch, but I'll come to these later. Note, though, that pictures can't be

Figure 3. The studio for creating or altering pictures and headlines. Icons choose pens and fills, disc, copying and rotating facilities and pixel editor

loaded in straight from the library.

You now leave the art department and enter the copydesk. Here you load in the saved graphic, and put words and headlines around it. The words part of the package I found disappointing, as the text editor is crude compared to a wordprocessor (*Pagemaker* doesn't have one at all) and you can only get 32 characters (about five words) onto a panel line and there are just 23 lines to a panel. This means lots of white spaces when you justify text. The typeface is poor, being based on an eight-by-eight matrix, whereas printers use at least nine by seven.

You then save your text and graphics which is by now a fully-fledged 'panel' – the time has come to enter the page make-up area where the

Figure 4. 'Stun', the result of about a day's work on Fleet Street. All eight panels were done from scratch, apart from Sarah Brown and Groucho from the Graphics Library. Note that the horizontal rules cannot be carried across the central 'gutter' between the panels: the vertical rules do join up, though

designed panel is put in position on the page. Once this is done you have a completed 'page' so you save it to disc.

Finally, you leave make-up, and enter the print section. The page is loaded back in and can be previewed, which gives you a rough idea of how it will finally look (it's about half-size). Previewing takes about a minute and a half, and if you're happy, printing takes another three minutes. At last you have a printed

page – my effort is figure 2. Now if that sounds convoluted, let me confirm that it is – I would be astounded if anyone got it right first time. And if you have printer problems (as I did with a Mannesman Tally MT85 which has to have a line feed set up), you have to go all the way back to the set-up stage!

After working my way through the tour and having a go with the studio, I realised the system just didn't seem to agree with me.

The black and white case for colour

Pear Tree are now offering the most powerful art package yet devised for the BBC Micro – Artist.

Artist is a new 16k language ROM compatible with the BBC Micro, BBC+ and the new Master Series, allowing full manipulation of a mode-2 screen. With Artist and Megamouse, colour graphics take on a completely new dimension, which has to be seen to be believed.

Copying specific screen areas to exclude certain colours. Drawing and painting underneath any colour combination. Making your brush cycle through a defined colour sequence. Colour pattern editing. Sprites of any size. Animation. Just a hint of how Artist is the most highly advanced software package yet designed, with features never before seen on the BBC Micro. The only limitation of Artist is your imagination.

With the ultimate in art packages comes the ultimate mouse – Megamouse. Built to professional standards and comfortably shaped, it provides sensitive, accurate movement, that is unbeatable.

This exclusive Pear Tree offer includes the Artist ROM, the systems disc, a users manual and an excellent grey shade Epson printer dump – all for just £55.

You have the option of buying the Megamouse separately, or saving £10 by buying the complete package.
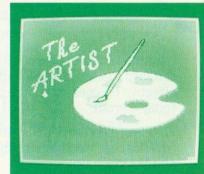
Artist is already ahead of its time. Don't be left behind – order now before it's too late.

ARTIST
A masterpiece in colour graphics from only
£55

PEAR TREE COMPUTERS
Falcon House, High Street, Huntingdon,
Cambs PE18 6SS Tel: 0480 50595

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There are niggling little things, as with any software, but there are some fundamental design decisions which annoyed me. One was the laborious way of saving pictures. There are different ways of saving for the sections you visit and each one has several stages.

Readers who use wordprocessors will appreciate the need for regular saving of text in case of pressing Break accidentally, or losing power, but *Fleet Street* makes this a real pain: it's complicated and time-consuming. For example, if your graphic fills the whole screen, it's a real art framing it for saving, and if you go outside the page area you have to start again. There is no default for saving the whole screen, which there should be to encourage regular saving.

The idea of using panels is quite simple, but limiting. Each panel is a set size, so if your page design doesn't neatly fit into eight parts you are in for some trouble. I had this problem in creating the 'Stun' page, where I couldn't join up the rules to make the box (figure 4). Of course it's easy to draw in with a pen on the

Figure 5. The Groucho panel has been taken from the studio to the copydesk, where the words are added. Note the choice of type fonts in the top right

printout afterwards but goes against the grain. Another limiting factor is that the package only allows two columns of text (*Pagemaker* allows more). Going back to the newspaper analogy, show me a paper working to this rule! However, I found out later that Mirrorsoft had worked out a way to do it by setting up a graphic for each half of a panel, and writing over it in the copydesk.

By getting to know *Fleet Street*, I'm sure many of these limitations will become 'features', and in time ways around them will be found – for which the promised newsletters will be vital. Mirrorsoft is also set to bring out three support discs by May. One will contain extra graphics, a text font editor and 10 more fonts; the second will be full of Walt Disney
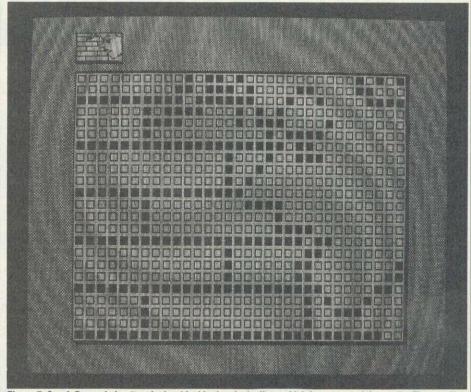
Figure 7. Sarah Brown being 'touched-up' inside the pixel editor, which forms part of the studio. The scrolling on this has to be seen to be believed

characters; while the third will be a utilities disc. Mirrorsoft is also working on a 'wire room' with the package linked to a cheap picture digitizer and modem. It is this level of support from Mirrorsoft (and third parties I imagine) that will really get the package going.

With all this in mind I set out to put the system through its paces by doing a mini tabloid front page, and the 'Stun' page of
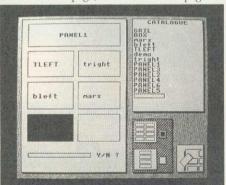
Figure 6. Page make-up: panels are pulled in to make a page. The Y/N question refers to whether the panel is to be 'stretched', as in figure 1

figure 4 was the result. The girl was taken from the library and touched up – she originally had a chin like Frank Bruno – using the excellent pixel editor (figure 7) in the studio (the scrolling speed has to be seen to be believed).

The background was added to form the picture for the lead story. I used Groucho for a second story and then started from scratch on the Flook cartoon.

The end result

The end result is neat and impressive, but is it any better or quicker than using scissors and paste? With long documents I reckon you're better off with a good wordprocessor and printer because the text is so much better. However, if you want to produce one-off leaflets with lots of graphics you can have a great deal more fun with *Fleet Street*, produce very clean pages and it's an impressive package for £40. The graphics library and studio are worth using as an addition to cut and paste.

Next month I'll tackle *Super Pagemaker* from AMS with their Mouse and give a final summing up of the merits of these two publishing packages. We look forward to seeing the results readers can achieve with *Fleet Street* and *Pagemaker*.

S O F T W A R E / R O M S

FOUR PLUSES FOR WORDWISE

Patrick Quick looks at four utility packages for *Wordwise Plus*

Since *Wordwise Plus* was published last year more and more 'segment programs' (or sprogs) have appeared in magazines and many users have written their own. They are easy to write and can be very useful, so it was only a matter of time before packages of utility sprogs were published. This review covers four such packages, three on ROM and one on disc. Watford Electronics' *Word-Aid* ROM and Beebugsoft's *WordEase* disc each offer a mixed bag of general-purpose utilities with no strong theme. Norwich Computer Services' *Continuous*

Processing ROM (CP-ROM) contains a suite of sprogs aimed specifically at making it easier to spread a document over several disc files. Interface Electronics' *Wordwise + +* ROM is different. Its main offering is extra string handling commands for *Wordwise Plus*, programmed in machine code, but it also includes a few general sprogs for good measure.

WordEase

This 40/80 format disc contains around fifteen different utilities, selected from a menu. The

range is wide and many are good and well-programmed with plenty of user-friendliness and flexibility, but one or two are a bit too slow to be useful. I am already using the 'auto version save' for this review, and the label printing and mail-merge look flexible. The 'section renumbering' automatically handles numbered paragraphs of the 5.3.1, etc, format and also amends all cross references to paragraphs. I don't know how useful this is likely to be to you but I don't use that type of numbering and if I did it would probably be on a document too big to fit in memory.

Beebug has the advantage over the others in offering its product on a disc, which allows a lot more space for messages and clear prompts and a wider range of routines (*WordEase* fills about 32k of the disc). It was also fairly easy to add my own routines into the menu structure, especially after using *WordEase* to expand the abbreviated keywords in the menu sprogs. I can see myself using this package as the basis of my own compilation of sprogs. A poorer decision made by Beebug was to put the main menu in segment 9. Pressing Shift/f9 all the time is a bit dangerous for my liking, f9 being so close to Break. I did, though, like the fact that Beebug clearly states that users can make one backup copy of the disc for their own use.

Word-Aid

Like *WordEase* this package offers a selection of sprogs, but this one's in a 16k ROM which rather limits the space available. Slightly fewer options are given and many are trivial and inflexible. The printer codes, label print and mail merge are inferior to the ones from *WordEase* and the continuous processing options come nowhere near the sophistication of Norwich's ROM. The only things that scored over the others were the multi-copy printing routine (I had already written one myself and can't imagine why everybody else left this out) and the sorting facility. Overall I found *Word-Aid* insubstantial – I would want something much more impressive before sacrificing a valuable ROM slot or the cash, especially as on ROM you cannot make even minor amendments to the routines. I have just noticed that Watford is offering *Word-Aid* free with *Wordwise Plus* in their January 1986 advertisement – at that price I suppose it's not bad.

COMPARISON TABLE					
	Word-Aid	WordEase	CP-ROM*	WW + +	WW + + disc
Compact sprog	—	3	—	3	3
Analyse sprog	—	3	—	—	3
Text transfer	3	3	—	—	4
Clear segment/text	3	—	—	—	P
Display variables	—	—	—	2	P
Show seg/text status	—	1	—	—	—
String functions	—	—	—	5	—
Printer codes	3	3	—	—	P
Multiprint	3	—	—	—	—
Printer symbols	—	3	—	—	—
Stored page layouts	—	1	—	—	—
HR1 exclamation	—	—	—	1	P
Continuous proc: select	3	—	5	—	—
Continuous proc: print	3	—	4	—	—
Address finder	2	—	—	—	—
Label print	2	4	—	2	P
Mail merge	2	3	—	2	P
Basic line numbers	3	—	—	—	P
Split Basic lines	—	—	—	3	—
Disassembly labels	—	—	—	4	P
Auto-version save	—	4	—	—	5
Disc menu	—	3	—	3	3
Function key edit	—	3	—	2	P
Renumber sections	—	4	—	—	—
Align numbers	—	1	—	—	—
Sorting	4	3	—	—	P
Mark chapter	1	—	—	—	—
Search and replace	3	3	3	—	—
Remove embedded cmnds	3	3	—	—	P
Alter preview mode	—	—	—	1	—
OVERALL					
Ease of use	2	3	4	4	3?
Facilities	2	3	3	4	3?
Value for money	2	3	3	3	5?
Price (inc VAT/p&p)	£19.55	£21.50	£15	£19.95	£1.50

KEY: 1 = poor, **2** = bearable, **3** = good, **4** = very good, **5** = exceptionally good, **P** = promised
*Now replaced by CP-ROM2 at £25

CP-ROM

CP-ROM contains a suite of sprogs to enable a single document to be spread over several files on one or more discs. There are two advantages to this facility: one is that your document can be almost any size, limited only by disc space rather than RAM space, and second, even for a document that fits into RAM, by splitting it into smaller sections you can preview it in 80 columns. The second advantage can be obtained for smaller documents by fitting a 'shadow' screen RAM board (such as the Aries B20) or adding a second 6502 processor. However, neither of these will give you much more total space for your document.

CP-ROM keeps a file called !FLIST on disc which contains a list of the files in use, including (if necessary) the drive number and directory for each file. !FLIST also keeps a note of the current file in the list so that when it restarts, *CP-ROM* loads the last file you were using. Switching between files while editing is easy (but not automatic). Printing, previewing and search and replace can be performed over the whole document at once. This is not as convenient as having a wordprocessor specifically designed to edit large documents but it is not bad as most large documents break down naturally into chapters anyway.

Basically *CP-ROM* works as promised. The only small problem occurred when printing several or all of the files. The current file was printed as the version on disc, not the possibly different version in RAM, although this RAM version was preserved throughout the operation. The sprogs are in ROM Filing System (RFS) format on an 8k EPROM which seems a bit tight now that 16k EPROMs have become so much cheaper.

In fact *CP-ROM* has just been replaced by *CP-ROM2*, offering 16k for £25, featuring multiple disc documents of unlimited length, 80-column preview regardless of file length, 10 pages of help information, improved previewing, printing and formatting facilities, and enhanced file list manipulation.

Wordwise + +

Wordwise + + (aka String Extension ROM) contains a set of functions to extend the string handling in *Wordwise Plus* sprogs which are made available just as though they were in the *Wordwise Plus* ROM. *Wordwise + +* works intimately with the *Wordwise Plus* ROM, intercepting the error vector, so you must have the correct version to match your *Wordwise Plus*.

The 24 functions offer substring (including LEFT\$, RIGHT\$ and MID\$), padding, search and replace operations on strings (you *can* do these things in *Wordwise Plus* but they are slow). All in all they seem to be a well chosen set of enhancements to *Wordwise Plus*'s string handling facilities. As an example, the function LPAD\$(B\$,":",10) in sprog 1 below means 'pad out B\$ on the left with colons to a total length of 10 characters', ie, B\$ becomes ":::::HELLO". Sprog 2 does the same job using standard *Wordwise Plus* commands, while sprog 3 executes the empty loop to find more precise timing figures.

The timings (in milliseconds per loop) are: sprog 1 = 185ms; sprog 2 = 1045ms; sprog 3 = 73ms. Thus the LPAD\$ loop took 112ms whereas the 'straight' *Wordwise Plus* version

WordEase: well-programmed and flexible

took 972ms, over eight times longer! You cannot expect an eight-fold improvement in all cases but this ROM should speed things up considerably as well as making 'sprogramming' easier.

Wordwise + + also has four 'star' commands and six utilities in RFS format. The star commands offer function key definitions, single key file selection from disc (nice, especially the auto-boot option), alteration of default preview mode (why?) and printout of all *Wordwise Plus* variable values. Five of the RFS utilities are sprogs – in particular, there is a dissassembly labeller. I've wanted one for years and have never seen one anywhere else. The routines for label printing and mail-merge are rather minimal. The last RFS file is a short machine code routine to make a Brother HR1 printer produce exclamation marks.

I am told that copies of these RFS files, together with a few more utilities, are due to be put onto a disc which will be available soon at a nominal cost of £1.50 inc. This disc is no use without the *Wordwise + +* ROM as the new string facilities are used. The sample I have been sent shows a similar range of utilities to

the Watford and Beebug offerings except, of course, that the string extensions are used to give shorter, faster utility sprogs.

Overall

I was pleased to find that the manuals for all of these packages were fairly clear and easy to use although the *CP-ROM* manual was wordy.

These utilities are the first examples I have met of RFS files and I am astounded at how slowly they load! Normal ROM utilities (*Wordwide Plus*, *Disc Doctor*, etc) are extremely fast but RFS files seem to use a separate ROM service call for each byte read. A hard disc over a network should be much faster than RFS files. *WordEase* is not constrained by lack of space and is easily amended; neither does it use up a valuable ROM slot in your Beeb.

On the other hand, with the ROM based packages you do not have to find your utility disc before starting or keep copies on each wordprocessing disc you have.

None of these '*Wordwise Plus* assistants' will work fully over a network. Both *Word-Aid* and *WordEase* select the discs for you with *DRIVE commands. However, it should be possible to amend *WordEase* to avoid this and to keep the main utilities in a library directory. I don't know what Beebug's attitude would be to this but I believe it is generally willing to consider network usage of its software. All three ROM-based packages reselect disc (with *DISK) after loading utilities from ROM. The main features of *Wordwise + +* work completely within the ROMs, so a network should present no problems.

In summary, then, I cannot recommend *Word-Aid* as it is bettered in almost all respects by the others. Each of *CP-ROM* and *Wordwise + +* attack their chosen area accurately and can be recommended if you feel the need for their particular facilities. *WordEase*, although rather pricey for a fairly straightforward set of utilities, should be a good buy, especially if you can adjust the routines to suit your own requirements.

WordEase (disc)
Beebugsoft, £21.50 inc p&p & VAT
Word-Aid (ROM)
Watford Electronics, £16 + p&p (min. £1) + VAT = £19.55
Continuous Processing ROM2 (CP-ROM2)
Norwich Computer Services, £25 inc p&p & VAT
Wordwise + +
Interface Electronics and Computing, ROM £19.95 inc p&p & VAT, disc £1.50 inc p&p & VAT

The Concept Keyboard* has been developed specifically to help secondary teachers involve their students in interactive projects.

Designed for use with BBC B micros, the keyboard is touch-sensitive and user-friendly.

A variety of software programs accompanied by special overlays gives the teacher immediate access to practical and interesting projects. Four new programs have recently been added to our list:

D.C. Meters

A practical program which simulates a direct current electricity meter. The student can explore the intricacies of D.C. power systems through an overlay and various different screens.

Heat the House

Students are introduced to process control application by a cross-section house with several options. Through opening and closing radiator valves, introducing lagging or fitting double glazing a better understanding of heat flow is achieved.

Gumshoe Logic

This graphically illustrated puzzle program is designed to be both entertaining and educational. It will encourage logical thinking by means of mental detective work, introducing students to gangster-style characters and some interesting situations!
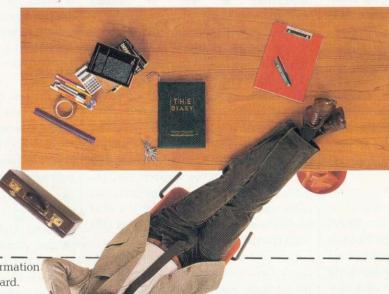
Small Mammal Survey

This interesting project relates to the habits of smaller mammals in their natural habitats. The student is able to set traps, mark the animals and release them in order to obtain information about population distribution, growth and habits.

Several weeks of intensive fieldwork would normally be required to undertake this type of study. The Concept Keyboard may also be programmed for special class projects of any type, involving students in the preparation of overlays and input of ideas.

If you'd like to know more about the Concept Keyboard and programs, fill in the coupon and send it to: AB European Marketing, Forest Farm Industrial Estate, Whitchurch, Cardiff CF4 7YS. Or telephone Cardiff (0222) 618336 today.
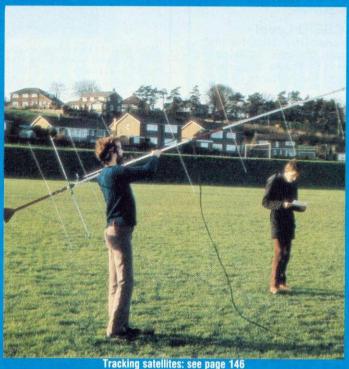
INTERACTIVE PROJECTS FOR ACTIVE MINDS

ACORNUSER

Tracking satellites: see page 146

GUIDE TO
EDUCATION

N E W S

Micro unit on the move

Micro-Robotics of Cambridge has developed a new micro controller.

This compact device may be programmed from a variety of computers and then left to operate independently. It has its own high-level resident language, designed specifically for control applications, which is simple to learn for anyone with previous Basic or Logo programming experience.

The unit runs independently of a power source since it carries batteries, which means that where portability and movement are important the unit has the flexibility to go where computers cannot.
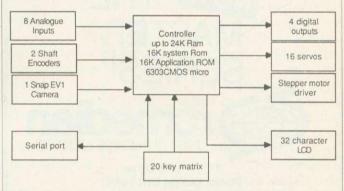
Teachers have long bemoaned children's preconception that a computer is a box with a keyboard on it.

This unit will help to dispel that myth and its great versatility will be proven by the flood of applications it will generate.

Optional extensions to the controller include a 20 character detachable keyboard, 16 character two-line LCD display, a range of sensors, servos, buzzers, the Snap EV1 camera, stepper motor driver and many more.

It costs £195 and details are available from 264 Newmarket Road, Cambridge CB5 8JR. Tel: (0223) 32310.

Micro-Robotics micro controller is suitable for use in a variety of situations

Teach-in on telephones

How do you teach a child how to respond to an emergency? What is the most effective method of training in the use of telephones?

Primary Programs think it has the answer with *Phonin*, its telephone skills package, developed in conjunction with MEP. The package comes complete with a British Telecom telephone (dial variety) and a connector to the analogue port. The software may be used with a Concept Keyboard.

A variety of tasks is undertaken including accurate dialling, dealing with emergencies, using directories and information services.

At all times the computer is used not only to monitor the child's accuracy but also to provide the motivating force behind the simulation. A payphone option is also available.

Details are available from Primary Programs, Claypits, Debden Road, Saffron Walden, Essex.

Set your own speed with Slomo controller

The Slomo Micro Speed Controller from Nidd Valley Micro Products enables teachers to slow down and freeze programs. It operates by giving interrupts to the central processor and fits into the Tube interface on the underside of the machine – for people with second processors an adaptor links the two devices. A version is also available for the Electron.

Teachers will find this of great use in a variety of applications: where a pupil has special needs and is unable to cope with the frenetic speed required for some programs, this device will allow him or her to work at an even tempo. Moreover, when demonstrating using a computer to a class, a teacher often wants to pause and freeze the action.

Mice

Also available from this company are two mice – the Anamouse and the Digimouse. The first is connected to the analogue port and is easily programmed using the usual ADVAL commands. The second is more conventional and will be compatible with both the AMX Mouse and Wigmore Megamouse software.

Details from Stepping Stones House, Thistle Hill, Knaresborough HG5 8JW. Tel: (0423) 864488.

Commentary by Nick Evans

	Title	Publisher	Cassette	Disc	ROM	Electron	Shadow on B+	6502	Econet
	EDUCATION TOP FIVE								
1	Maths	Longman	—	£17.50-29.95	*	—	—	—	—
2	Best 4 Language	Ask	£19.95	£19.95	—	Yes	Yes	—	—
3	French Mistress	Kosmos	£8.95	£9.95	—	Yes	Yes	—	—
4	Early Learning	BBC Soft	£10	—	—	—	Yes	—	—
5	German Master	Kosmos	£8.95	£9.95	—	£8.95	Yes	—	—

Compiled by Gallup/Microscope. *Contact publishers: BBC Soft, 35 Marylebone High Street, London W1M 4AA. Tel: 01-580 5577. Kosmos Software, 1 Pilgrims Close, Harlington, Dunstable, Beds. Tel: (05255) 3942. ASK, Kosmos House, 68 Upper Richmond Road, London SW15. Tel: 01-874 6046. Longman, Burnt Mill, Harlow CM20 2JE. Tel: (0279) 26721.

Highlight in the spotlight

Highlight Software is the featured company in our small software houses section this month. It produces a wide range of primary materials which are programmed to a very high standard – in terms of maths, road skills and reading and language development these deceptively simple programs are some of the best I've seen.

Most are aimed at the seven to

Entertaining English: good 'taster'

11 age range. The principle is that the ideas should be presented in a stimulating and visually attractive way. For this reason nearly all the programs are 'arcade' in style.

Also, the programs have more than one level of difficulty, designed to allow children to develop their skills in a practical fashion. For example, in the *Adventurous English* package which deals with positional adverbs, the simple exercise used in the first part of the program is turned into an adventure game-cum-logic puzzle in the second. The *Read Right Away* series takes novel approaches to vocabulary and spelling and reinforces principles behind these skills without the child even noticing! I recommend *Read Right Away Pack 4* or *Entertaining English* as a taster.

Details from 36 Sherbourne Close, Barry, South Glamorgan CF6 5AQ. Tel: (0446) 745482.

Wordprocessing made easy

Three primary wordprocessing packages have just been launched which each copes with the problems of introducing children to the basic concepts of editing and text handling in a totally different way.

WordPlay from BBC Soft uses animation to make the available facilities attractive to users. For example, when right-justifying the text Eve the Elephant marches up from her place at the bottom of the screen and tugs the padded text into position. Other characters left-justify, control deleting, move and copy text, push lines up and down or implement the filing utilities. The whole package comes complete with a spelling checker and dictionary editor. *WordPlay* is available for BBC B and Electron on cassette, transferable to disc.

Probably the most sophisticat-

ed package of the three is *Pendown* from Logotron, which uses both chip and disc to give a wide variety of facilities.

Pendown incorporates not only a spelling checker and dictionary but also a 'tree'-based planner enabling the child to consider the title of the piece being written, the separate paragraph headings, elements within those paragraphs, sub-elements of those elements and so on to a depth of 10 levels. The whole plan may then be transferred into the wordprocessor with indentations marking the level being worked at.

On-line help

While the child is engaged in text creation there is on-line help with both vocabulary and spelling from the dictionary and its accompanying thesaurus facility.

Delete is effective in two modes – auto-repeat or single character. In single character mode the character above the cursor is deleted.

Print out of the final product is always important. The *Pendown* package allows a variety of fonts to be defined and comes complete with a Jumbo font which produces double-height, double-width characters.

Another wordprocessor has developed that facility further. *Folio* from Tedimen Software is a beautifully presented package which allows three different sizes of text to be printed. There is no attempt to provide a huge variety of facili-

Tedimen's Punjabi wordprocessor

ties – instead it's an extremely friendly introduction for even the youngest child. In common with *Pendown*, this package may be connected to the Concept Keyboard. There is clear indication of where one line merges into another, thus providing a visual clue to the continuity of text across page lines. File handling is simplicity itself and the whole package is designed to avoid the simple errors that little fingers can make.

Tedimen also produces foreign language word-processors and has Indian dialect packages which cover Hindi, Gujerati and Punjabi – Urdu and Arabic scripts will follow shortly.

Contact Tedimen Software, PO Box 23, Southampton SO9 7BD. Tel: (0703) 473774. Logotron, 59 Markham Street, London SW3 4ND. Tel: 01-352 1088. BBC Soft, 35 Marylebone High Street, London W1M 4AA. Tel: 01-580 5577.

Database to order

The entire database of educational software compiled by Nick Evans and featured in part on pages 159 to 170 is available from *Acorn User* in a variety of formats at £5.75. The datafile contains over 1700 records and is available for the *ViewStore* database. It may also be obtained as a text file for the *View*

wordprocessor which can be converted into a datafile for a number of other database packages with a utility for 'grabbing' records.

The disc comes complete with the address list of publishers and instructions as to the most appropriate methods for searching the package with *ViewStore*.

Please send me............Educational Software Database discs at £5.75 each.

I enclose a cheque/postal order made payable to Nick Evans for..................

Please tick format required:

Disc track/side	40/single	40/double	80/single	80/double
View text files	☐	☐	☐	☐
ViewStore datafile	☐	☐	☐	☐
ViewStore and indexes*	N/A	☐	☐	☐

* *Number of indexes available depends on space on disc*

Name ....

Address...

.... Postcode...........................

Telephone ....

Send to Nick Evans, *Acorn User*, Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF. Allow 21 days for delivery

FIRST TRACK YOUR SATELLITE...

Do you want to keep your eye on the 'eyes-in-the-sky'?
Then why not use your micro to keep track of them?

Craig Underwood and Eric Twose

A few keen amateurs have been involved in the tracking and receiving of data transmitted from satellites for many years, notably using the TIROS series of meteorological satellites. Recently the field has expanded to include satellites involved in scientific experiments and radio-amateur work which can be categorised as: polar orbiting weather satellites – the NOAA and the METEOR series; geostationary weather satellites – METEOSAT; scientific/radio-amateur satellites – the UoSAT series; and radio-amateur satellites – OSCAR and the RS series.

Each category has its own merits. For example, the NOAA, UoSAT and OSCAR spacecraft have the advantage of being fairly inexpensive to track in terms of ground-station facilities; however, they are only within range of the UK for relatively short periods each day. The geostationary METEOSAT is more expensive to receive because of its ultra high frequency (1.6945GHz) radio transmissions, but it has the advantages of producing very high quality pictures and of being available all the time.

Getting started

You don't need to be a technical wizard or have masses of expensive equipment to get started. All that is required for a basic satellite tracking-station is a radio-receiver tuned to one of the satellites, a suitable aerial (possibly home made), a tape recorder to record any transmissions received and a micro.

The particular equipment you use will partly depend upon the satellite you wish to track. We cannot go into great detail here, but have provided a list of some suitable equipment and further reading at the end of this article.

To save listening to 'white noise' for hours, you'll need some way of predicting when a satellite is within radio-range, and although this can be done manually, the micro will give you a fast and accurate fix on the satellite's position as well as providing a means of decoding and displaying received data.

Apart from the special case of a satellite in a geostationary (geosynchronous) orbit, all satellites appear to 'rise', move across the sky and 'set'. Thus they will not always be in the sky or within your radio-range.

If a satellite orbits the Earth at a height of approximately 36,000km its orbital period

equals 24 hours. If such a satellite is in orbit over the equator, it always appears to hang over a fixed point on the Earth's surface. This is very useful for communications satellites and some weather satellites as they can give continual radio or photographic coverage of almost a third of the Earth's surface.

To receive signals from a geostationary satellite, such as METEOSAT, all you do is point the aerial at the part of the sky where the satellite appears to hang.

Another important class of orbits is the polar one (as used by UoSAT, NOAA and most Earth imaging satellites such as LANDSAT). Here, the satellite is launched so its orbital path takes it close to the poles on every orbit; hence the name. The advantage of this is that as the Earth rotates under the satellite, virtually the whole surface of the Earth comes into view. This is particularly useful for Earth-imaging satellites which can

Antenna control station: BBC micro and control box

thus photograph the entire globe. These polar-orbiting satellites will pass within range of a ground-station in the UK four to six times per day. These passes occur in two groups, separated by approximately 12 hours. In one group of passes, the satellite will appear to be 'ascending', ie, travelling from the equator, towards the north. In the second group, (half an Earth revolution later) the satellite will appear to be 'descending', ie, travelling from the north towards the equator. These times can be found

by using tables, published by AMSAT-UK (see the references panel at the end of this article, page 151).

AMSAT-UK's 'OSCAR-locator' uses the information within these tables and provides a low-cost method of predicting the orbit of a satellite. The OSCAR-locator is a circular cardboard map representing a view of the Earth from above the north pole.

A movable 'D-shape' represents the generalised path of a polar-orbiting spacecraft over the northern hemisphere. This is free to move about the centre of the map, so it can be set up as indicated by the data in the tables to predict whether the satellite will come into range of the UK on that orbit and, if it does, at what time.

Complex orbits

The OSCAR-locator is just one method of keeping track of satellites. For more complex orbits, like that of OSCAR-10 (which is a very eccentric ellipse), there are some excellent computer programs available. AMSAT-UK can advise on suitable software.

Getting a computer to perform the same task as the OSCAR-locator is fairly straightforward, but a full blown orbital prediction package requires a lot of 3D co-ordinate geometry and a knowledge of the effects of atmospheric drag.

Tracking any of these satellites will require

Eric Twose manually pointing high gain yagi antenna while a student reads off the orbital prediction

some form of antenna but a 'long-length-of-wire' will only give a good signal with the Soviet RS (Radio Sputnik) satellites, which transmit on the comparatively 'low' radio-frequencies of 29-30MHz. All the other space-craft mentioned transmit at much higher frequencies and other kinds of antenna are more effective. Each category of satellite requires its own antenna, whose shape and dimensions are determined by the frequency and polarity of the radio signals transmitted. Signals from the UoSAT-1, UoSAT-2 and OSCAR-10 space-craft can be received using an antenna designed for 144-146MHz operation (the 2m band), while the NOAA series need one that works in the 136-138MHz band.

Unfortunately, METEOSAT transmits on a very different frequency – 1694.5MHz – for which it is difficult to make a conventional antenna with sufficient gain, so METEOSAT is usually received via a dish antenna. Such systems are available commercially and often have a 'down-converter' so they can be plugged into a NOAA-type, 137MHz receiver. However, these systems tend to be expensive.

The simple dipole is a basic radio-wave detector. In practice, the dipole is made out of two quarter-wave lengths of tubular aluminium mounted end-to-end with a slight physical separation and insulated from one

another by the plastic mounting. The external screening braid of the co-ax(ial) antenna downlead is connected to the end of one element, while the inner signal core is connect-ed to the other.

You could easily make such an antenna yourself. Or perhaps someone has an old VHF antenna tucked away which can be dismantled and cut to suitable dimensions.

Increasing the gain

The dipole has a low gain which means that only strong signals are detected, but it has the advantage of being omni-directional so it may be permanently mounted. To increase the gain, more 'parasitic' elements can be added. Unlike the active dipole, these are made from single lengths of narrower gauge aluminium and do not need insulating from the tubular aluminium antenna boom. The more elements, the higher the gain and the more directional the antenna, so high-gain antennae need to be steered so they actually point at the satellite as it passes.

In many ways, at VHF and UHF, the helix is an ideal aerial for satellite tracking as it's circularly polarised and easy to build (a plastic drain-pipe, some dowelling and a length of wire is all that's needed – it works very well!). The more turns, the more directional and the

higher the gain; the fewer the turns, the less gain, but the less accurate you have to be in pointing the antenna. For example, with about two turns, the antenna can be permanently mounted pointing up and it will then pick up most passes.

Another bonus of the helical design is that an antenna tuned into UoSAT will also work well with NOAA, provided you can easily rewind the helix the other way. This is because the radio signals transmitted by both spacecraft come down a bit like a corkscrew and whereas NOAA is a right-handed 'screw', UoSAT is left-handed.
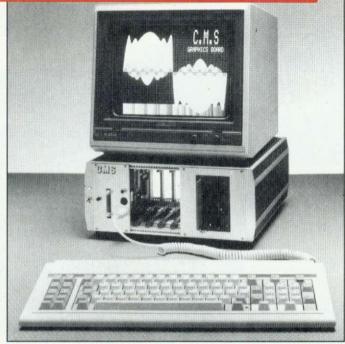
Dish antennae are only of use with the UHF transmissions of the geostationary METEOSAT. You could make a one- or two-metre dish from glass fibre and chicken wire/kitchen foil.

You can pick-up UoSATs 1 and 2 using a hand-held 144-146MHz narrow band FM 'walkie talkie' receiver (costing under £50) and by having a simple whip antenna.

Such a receiver allows you to listen to the 'Dalek-like' digitalker on board the UoSATs. This is a computer-synthesised voice which 'speaks' a series of numbers representing the status of the systems on board the spacecraft. However, if you are interested in actually recording the digitalker's spoken telemetry or

the two satellites' digital tone-encoded telemetry, you should check that the receiver has an audio output/headphone/extension speaker socket, so you can take an output to a cassette recorder or portable reel-to-reel machine.

A simple receiver-antenna system such as this will get you started and will be sufficiently sensitive to allow you to collect data. Some days during the week one pass will be close enough to allow reception of a good deal of data on that pass and some data on the earlier and later pass; on other days, two passes will fall either side of your tracking station, so you'll be able to get a fair amount of data from these two passes.

However, if you want to pick-up more data, more reliably, you'd be advised to get a better receiver. Around £60 will buy you a 2m narrow band FM receiver that looks like the sort of CB rig mounted under the dashboard of cars. The only thing about these receivers is that they'll only allow you to pick up UoSATs 1 and 2.

The NOAA series transmit at VHF on the 136MHz band – see 'Downloading the Weather', *Acorn User* August 1984, for more details.

If you are prepared to pay a price of between, say, £150 and £700, there are receivers and transceivers (transmitter plus receiver)

View of antennae: yagi left, NOAA right, and simple dipole

Scarborough Sixth Form College and got involved with satellites in January 1984, when we received a booklet from the University of Surrey about UoSAT-1. To start with, we bought a receiver for about £50 and made up a crossed-dipole aerial out of wood and welding-rods, which was connected to the receiver by a length of standard TV co-ax. With this basic

Antenna control box allows manual control via the joystick

on the market which will allow you to cover most of the current satellites.

A number of manufacturers are now producing 'complete systems', ie, aerials, receivers and decoders, for some of the satellites mentioned. These might well represent a good entry point into satellite tracking – as always, though, it pays to shop around.

A practical set-up

The Ground-Track Project was set up at

system, UoSAT-1's telemetry and digitalker was picked-up for the first time on February 29 1984. A quick program was then written to produce experimental results from the numbers which were keyed into a BBC micro while listening to digitalker.

It was quickly realised that the path of the satellite had to be predictable, as up until that time, the receiver had to be left on all the time, as we had no idea when the satellite was within range. It was also found that getting results

from digitalker wasn't very satisfactory, as it took a few minutes for the telemetry to be 'spoken'. During this time, there were many bursts of noise which made it difficult to understand the electronic speech.
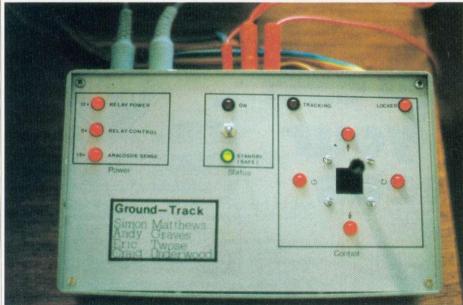
On the other hand, the digital telemetry was transmitted continuously, each 'frame' of data lasting five seconds. This would provide far more data per pass, and be more error-resilient, but it needed some additional hardware before the signals could be decoded. Thus, shortly after picking up the first few signals, we began to write an orbital prediction and a telemetry data handling package. These were to become *Sat-Pack*.

Perfect reception

Meanwhile, UoSAT-2 was launched and as its signals were directly compatible with the BBC micro, we concentrated on this spacecraft. We were also lucky enough to be loaned a cross-polarised yagi aerial by the Physics Department of the University of York. Although bulky, this enabled us to pick up the satellite's signals close to the horizon and achieve pass times in excess of 15 minutes with mostly perfect reception of data.

It soon became clear that if we were going to stick with a high gain antenna, some form of remotely-controlled system was required to track the spacecraft. To this end, an ex-outside broadcast camera mount was bought for £45.

After about a year's project work, we've managed to get this system under the complete, real-time control of a pair of BBC micros. One runs the *Sat-Pack* orbital prediction package which outputs tracking data via the RS423 port, while the other runs our control program, taking this data in and tracking the aerial automatically.

Recently, work has restarted on UoSAT-1. We are testing the prototype of a system called Astrid (produced by MM Microwave Ltd), which consists of a simple dipole aerial, connected to a receiver/decoder which has the ability to control a cassette recorder. The on-board decoder produces TTL signals from both UoSATs and plugs into any RS232-compatible port. On our system, it is linked to the RS423 port on the BBC micro, which is running the *Sat-Pack* telemetry handling/graphing packages.

We are also beginning to investigate the use of satellite weather pictures received from NOAA. We have a Cirkit weather receiver (about £50) connected to a turnstile aerial (from Halbar).

This is mounted on the roof, pointing up. It is found that the signals are only strong for a couple of minutes on a good pass, so we really need a pre-amp, or a steerable, high-gain aerial. The pictures are recorded on the BBC micro via the Unilab interface.

The *Sat-Pack* package currently comprises three discs. *Orbital Prediction* is a very powerful suite of programs designed to locate the position of any satellite (including those of high orbital eccentricity) and to plot its ground-track so the user knows exactly when a satellite is within range of their receiver. Information can be displayed in a variety of forms including tabular 'Whole Earth' Mercator Projection, Northern Hemisphere Polar Projection and European Theatre Projection. Data is also sent to the RS423 serial port or disc file to allow control of a tracking aerial.
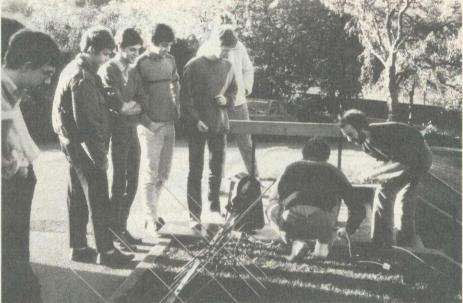
UoSAT-2 Telemetry is a suite of sophisticated data handling programs, specifically written to decode the telemetry transmitted by the University of Surrey's satellite, UoSAT-2. This data can be picked up as a 1200 baud Audio Frequency Shift Keying (AFSK) signal, very similar to the signals which encode BBC micro programs onto cassette tape. By feeding these signals into the cassette or RS423 port of the Beeb from a tape recording or in real-time, they can be translated into numerical data which are analysed for errors and stored on floppy disc as a 'processed data file'. This can then be displayed in a variety of ways. The

Getting ready for pictures: students fit the yagi antenna on the camera mount

processed data file has a simple format so the user can write his or her own data handling routines to complement the package.

Graphics Disc is a suite of programs allowing the user to graph the telemetry data generated by the second disc, and to look for data correlations.

Sat-Pack is already in use in many schools and colleges and is rapidly becoming the 'industry standard' among radio-amateurs. It's available through AMSAT-UK and directly benefits the Space Programme.

Conclusion

We started satellite tracking for an initial cost of about £50. Our present system, excluding computers, is worth about £360. This includes an aerial and receiver for NOAA, a high gain aerial, rotator and receiver for UoSAT-1 and 2, Astrid for the UoSATs plus the complete *Sat-Pack* software (three discs). That is, for less than the cost of a BBC micro, we can track most of the satellites generally available, providing work in computing, electronics, control technology, physics and geography.

You don't have to be a technical wizard to get started and satellite tracking is not only educational but also great fun!

REFERENCES

Useful books

The Satellite Experimenter's Handbook, Martin Davidoff, ARRL
The Sheffield Project, S J Spencer
VHF/UHF Manual, RSGB
ARRL Radio Amateurs' Handbook, ARRL
Oscar News, AMSAT-UK
Bi-monthly journal with Orbital Calendar. Free to members, but the calendar is available to non-members for a small fee.
All these publications are available from AMSAT-UK, which is a totally voluntary radio amateur's satellite organisation and user group.

Contact Ron Broadbent, G3AAJ, Hon Secretary, AMSAT-UK, 94 Herongate Road, Wanstead Park, London E12 5EQ. Please enclose an SAE.

Aerial suppliers

Halbar Ltd, Unit 1, Bury Walk, Bedford MK14 0DU. Tel: Chris Meadows on (0234) 44720.
UoSAT, NOAA turnstile aerials, etc, plus a complete weather satellite system.
Randam Electronics, 12 Conduit Road, Abingdon OX14 1DB. Tel: (0235) 23080.
Multi-element yagis, etc.
Jaybeam Ltd, Kettering Road North, Northampton NN3 1EZ. Tel: (0604) 46611.
Antennae and accessories.

Receivers

MM Microwave Ltd, Unit 1, Thornton Road Industrial Estate, Pickering, N Yorks YO18 7HZ. Tel: Steve Webb or Ken Maddock on (0751) 74713.

Can supply Astrid, a complete system for UoSAT.
Cirkit Distribution (formerly Ambit), Park Lane, Broxbourne, Herts EN10 7NQ. Tel: (0992) 444111.
Can supply receivers, pre-amps, converters, books, etc.
Timestep Electronics Ltd, Wickhambrook, Newmarket, Suffolk CB8 8QA. Tel: (0440) 820040.
Can supply a complete system for UoSAT or NOAA.
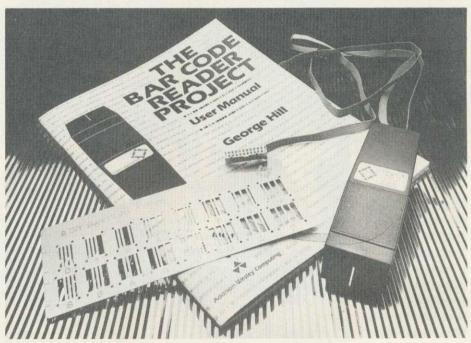
Software and hardware

Sat-Pack and other satellite software is available from AMSAT-UK, together with hardware decoders, PCBs, etc. Contact: 94 Herongate Road, Wanstead Park, London E12 5EQ. Please enclose an sae.

BAR CODE

VISION OF THE FUTURE

We explore the subject of computer awareness and look at the need to teach children the facts of computer life

Chris Drage and Nick Evans

'Why "computer awareness"? What's so special about the computer that we need to be made aware of it?' These questions are often thrown at computer enthusiasts who try to persuade their colleagues, especially in school, to realise the role that the computer can play in their work. In rather stilted terms we can mention 'pen awareness' and 'chisel awareness' especially if we talk about them as tools for performing certain tasks. 'chalk awareness' and 'overhead projector awareness' are ones that should be within every teacher's experience. The computer as a tool, for children and adults, inside school and out, is becoming of vital importance. This is reflected in the growing numbers of packages designed for teaching children the facts of computer life and bringing their teachers' methods more up-to-date.

Short-term problem

The problem with computer awareness is that it *should* be a short term problem. Even with the rise of the computer in every aspect of our lives many people are still unaware of its possibilities. They need training. Children too, especially in the upper parts of the junior and throughout the secondary school, do not have any depth of knowledge about the computer unless they have been trained. However, if you take the average eight or nine-year-old in the class of a 'computerate' teacher and ask them to use a program, awareness of the way things work, the setting up of the machine, the layout of the keyboard and a general familiarity and air of unconcern becomes immediately noticeable. This child is already 'computer-aware'. He or she will not need a computer awareness course as it is at the moment – computer studies, perhaps – the computer already is a normal part of everyday life.

Every time the school computer is used it builds on teacher's and pupil's awareness of the micro's capabilities and shortcomings. Both

children and teachers need to understand what micros are, what they can do and how they do it. This is an area vital to the primary school, where, for a variety of reasons, many teachers are still very unaware of the power of the micro in aiding learning. Any way the technology can be de-mystified, made 'more friendly' and can be seen to further children's learning in the classroom must be welcome.

For very young children the concepts related to understanding the role of microcomputers are too complex. It's unnecessary to formalise their computer understanding beyond actually sitting them down and letting them interact with good software which relates to their everyday experiences. By the middle or top of the junior school, however, the situation is different. When presented in the right way, children do begin to understand the concepts involved, and it's at this level where two very successful resources come into their own: *Using your Computer* from BBCSoft/BBC School Radio and *The Micro at Work* from Granada TV/GSN. Adopting two differing approaches, both these packages are extremely valuable in the primary school.

Using your Computer first appeared two years ago when it was broadcast as *Introducing Science Extra*. Its Computer Synchronised Audio

Using your Computer first appeared two years ago

'BBCSoft's approach is an instant success'

(CSA) approach is the brainchild of Arthur Vials and Fred Harris (of *Micro Live* fame). It's a technique which combines an audio voice-track with software to provide a unique audio-visual presentation (see Education News in the February '86 issue of *AU*). This approach is an instant success in the primary classroom.

BBCsoft now presents the broadcast and software tapes with a comprehensive manual which contains the scripts for each of the four topics, including In the Picture; Does it Think?; Basically Speaking; and Bags of Chips.

I decided that this package would be an excellent opportunity to help a computer-shy teacher and her 10-year-old pupils get to grips with the school's BBC micro. The teacher concerned worked through each of the CSA presentations herself before involving the children, which proved very valuable as she learnt

'so much about computers' it gave her confidence to introduce the micro into her teaching. With the children in groups of four, she set up a cassette recorder with a junction box and four headphones attached, which enabled the group to work silently without distracting the rest of the class (I had previously turned off the Beeb's sound output by *FX210,1). When every group had completed the first presentation they began the next. It proved a very stimulating and rewarding experience for all concerned. My only criticisms of an otherwise excellent package are the desperate need for a tape-to-disc copier routine to handle transfer to disc storage, and a way of silencing the sound output from the computer.

Computers at Work, also by BBCSoft, will provide a valuable follow-up for this class.

as a 'visit' to a particular location where computers are at work. They illustrate how computers provide solutions to particular human problems, emphasising the interaction of humans with computers and the benefits of computerisation. Each programme illustrates how scaled-down versions of featured applications can be handled in the classroom. Although they will have been broadcast by now, a compilation video will be available from Granada – alternatively your local teacher's centre may have recorded the broadcasts.

As each topic is independent of the others, the broadcasts can be regarded as starting points from which a number of activities can evolve – the series booklet provides a wealth of suggestions for developing the topics and providing follow-up activities.

is excellent. With the exception of programme eight (the delivery of which I found rather weak), the broadcasts provide a real starting point from which all manner of activities can stem. There is considerable freedom to organise these activities in any way a teacher finds suitable, with or without the computer.

Both BBC and Granada TV provide more than adequate computer awareness materials for the children – but what about the teaching staff? Until all teachers understand the possibilities offered by computers to enhance children's experiences and are willing to have a go themselves, educational computing will only occur in patches throughout the school.
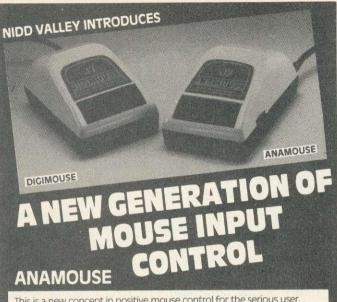
Impressive titles

It is with the development of computer awareness through in-service training that Resource (Humberside and South Yorkshire MEP) has produced its *ISIS* pack. The *In-School-In-Service* package provides 11 items of software, a modified NESTEC buggy (with interface board), complementary teacher materials relating to each pack and a case study of computer use in industry with 15 accompanying slides. The software titles are impressive enough: some are 'vintage' pieces; others newly designed especially for the pack. Yet what makes the *ISIS* pack so special is that it comes complete with a delivery system to enable each school to create a structure in which the materials can be used across the curriculum – a system whereby the staff can communicate their computer experiences to their colleagues through school-based INSET courses. For teachers using the school computer for the first time there are considerable support materials to guide them through a series of lessons and help with learning is provided by school-based in-service courses.

There isn't space here to do the *ISIS* pack justice. Resource was voted the Educational Software House of 1985 by *Educational Computing* and the *ISIS* pack only confirms this choice. If you have teachers in your school who say: 'I don't understand computers' or 'I don't have the time to learn about it' or, 'I cannot entrust the children's learning experiences to a fallible machine', the *ISIS* pack will go a very long way in helping them undergo a change in attitude. It provides a crutch, a stimulus and a starting point in a large range of school computer applications.

Also from Resource comes the *IT in the Secondary School* pack which provides materials and case studies for introducing secondary school pupils to the ideas of how a computer is linked to a variety of real life applications.

This emphasis on the computer in business is taken up by many other packs, all vying for

'Computers at Work also uses CSA and is a valuable follow-up to *Using you Computer'*

Using the same CSA format, it is also aimed at nine- to 12-year-olds. It looks specifically at two of the most important and exciting applications of computers: robots and information technology (wordprocessors and databases). Children familiar with the former pack will undoubtedly look forward to the latter.

How computers are used

Granada TV has put together a particularly exciting package of TV broadcasts and computer software called *The Micro at Work* which is aimed at the top end of the primary (lower secondary) school. A series of 10, 15-minute broadcasts serves as resource material for teachers wishing to introduce aspects of computer usage into the curriculum. Unlike the BBCSoft packages, the stress is on how computers are used, not how they work or are programmed. The broadcasts can be regarded

Three packs of software are available separately. The first and third packs provide excellent simulations: *Travel Agent* is particularly useful as the whole class can be involved in planning and describing their 'holidays', and *Design A House* is an impressive and outstanding piece of software which one would not expect to find as part of a series. The two disc pack comprises all the materials needed to design a house, plan and modify its furnishings and print out the designs, and, like *Travel Agent*, large numbers of children are catered for. Most of the children work away from the computer while each group tests its design – for added reality, each group has its own budget in which to work.

I found the second pack lacked the sophistication of the others, adopting an 'electronic blackboard' approach.

The flexibility of this series of programmes

schools' attention. *Computers, Information and You* from Acorn/CES follows a thematic approach to the subject in which the businesses in a small town are faced with the problems of integrating the new technology into their work. Data handling, design, spreadsheets and problem-solving are tackled in a thorough fashion. Also from Acorn/CES is *The Information Age*, which deals with the implications for the home and studies banking, communications and wordprocessing.

Excellent package
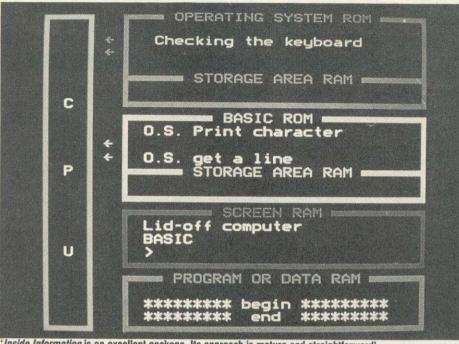
BBC Publications has a more advanced guide to computer use called *Inside Information – Computers, Communications and People*. This package is excellent for a variety of reasons. First, it has appeal at a number of levels. For teachers, as an introduction to computer use in industry it can perform a similar task to the *ISIS* pack on the use of computers in the classroom. Its approach is mature and straightforward. As far as possible it tries to deal with jargon in a sensible way, explaining as it goes and, because of its approach through a variety of media, if its message doesn't get through in one way, it will in another.

The pack contains a substantial colour paperback book, two audio tapes and a pack of software which deals with control, wordprocessing, computer operation and data handling. So complete is this package that the City and Guilds of London Institute has built a course on Information Technology around it.

As explained earlier, computer awareness in education divides into two main areas – pupil awareness of their world and teacher awareness of the possibilities for computer use. This last is likely to be of great importance soon, as the Microelectronics Support Unit swings into action with development of teacher support materials *for existing software* as one of the main aims in its brief.

Despite the widespread availability of both computers and software (see page 159 for a software database which represents only some of the education material currently available) many teachers have not yet ventured into the realm of computer use. Many are intimidated, others apathetic, some frightened. Being naturally resistant to change, many teachers have not taken to the micro in the way one might hope. Moreover, many staff had bad early experiences – programs wouldn't load and when they did they often crashed.

Getting over this antipathy is a problem, not least because of all the recent disruption in education. Nonetheless a number of initiatives are forcing teachers to sit up and take notice, not least among them TVEI (Technical Vocational Education Initiative) which has present-

ed schools involved in the scheme with vast sums of money to spend on integrating technology into the syllabus. The first step in any such enterprise must be teacher education and many of the above packages will work for teacher home-study and in the classroom.

Children's needs are different. The study of computer use is attractive if it's aimed at the right pupils at the right time. *Inside Information*, for example, would be totally inappropriate at the lower end of the secondary school since it is aimed at the Further Education market. However, studies of computer applications which have links into other curriculum areas expand usefulness to the teachers and get away from the idea that the computer is for use only in the computer room. Take, for example, a component part of the *ISIS* pack – the Lettuce Factory Case Study. This item was devised by Stan Spencer, Advisory Teacher in Computer Education in Sheffield, for use in the lower secondary school. It looks at the effects that computerisation had on a market garden specialising in year-round lettuce production. Not only is the use of the computer important in this package, but also an understanding of the things which the computer is controlling – the biological processes, the environment in the glasshouses, the problems of weather and so on. All of these have links into other areas meaning that a cross-curricular approach can be developed.

Computer awareness must be relevant to both pupils and staff. It must serve to enhance education. It should build a realisation that computers are used in a much broader context than that demonstrated in many schools' computer laboratories. If some of the packages

mentioned above achieve only a part of this, they will have been well worth the money.

'*Inside Information* is an excellent package. Its approach is mature and straightforward'

PROGRAM DETAILS

Computers at Work BBC B, cassette, £19.95
BBCSoft, 35 Marylebone High Street, London W1M 4AA. Tel: 01-580 5577

Using your Computer BBC B, disc (Econet compatible), £29.95
BBCSoft, as above

The Micro at Work Pack 1 BBC B, cassette or disc, £12.42
Mercury Music, Dept MW, PO Box 194, Sevenoaks, Kent TN15 8TZ

The Micro at Work Pack 2 BBC B, cassette or disc, £12.42
Mercury Music, as above

The Micro at Work Pack 3 BBC B, disc £17.95
Mercury Music, as above

ISIS BBC B, disc, £130
Resource, Exeter Road, off Coventry Grove, Doncaster DN2 4PY. Tel: (0302) 63800

Inside Information
BBC B cassette (transferable to disc), £28.85
BBCSoft, as above

IT in the Secondary School BBC, disc, £19.95
Resource, as above
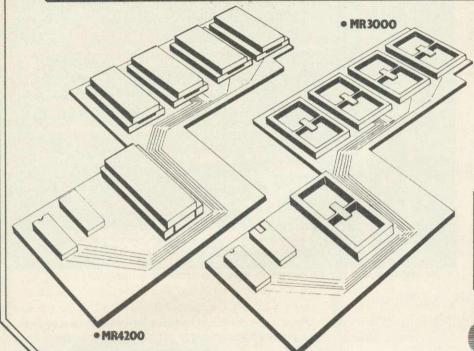
Computers, Information and You BBC, disc, £28.75
Acorn/CES, 645 Newmarket Road, Cambridge CB5 8PD. Tel: (0223) 214411

The Information Age BBC, disc, £34.50
Acorn/CES, as above

EDUCATION
SOFTWARE DATABASE

The selection of records printed on the following pages is taken from the educational software database compiled by Nick Evans for *Acorn User*. The records have been chosen from a variety of subject areas to give an idea of the content of the database. The full range of subject areas covered in the whole package is as follows (the letters in brackets are the key):

(a) Arithmetic	(o) Logo	(cc) Analysis/Classification
(b) Biology	(p) Physics	(dd) Database
(c) Chemistry	(q) Quiz, Test or Problem Solving	(ee) Topic Based
(d) Economics/Business Studies	(r) Rote	(ff) Food and Nutrition
(e) English	(s) Simulation/Adventure	(gg) Graphics and Art
(f) Road Skills	(t) Typing	(hh) Assessment
(g) Geography/Geology	(u) Statistics	(ii) Ecology
(h) History	(v) Reading and Spelling	(jj) Authoring
(i) Computer Studies/Control	(w) Writing	(kk) Careers
(j) Engineering/Technology	(x) Recognition and orientation	(ll) Computers in Schools
(k) Music	(y) Library	(mm) Management
(l) Languages	(z) Astronomy	(nn) Sociology and Psychology
(m) Mathematics	(aa) Wordprocessing	(oo) Religious Education
(n) Number Bonding	(bb) Design	

No responsibility is taken for inaccuracy in the listing. As far as possible prices and packages referred to have been checked from latest catalogues where these have been made available. Prices may vary with respect to whether they have been quoted including VAT or not. The machine classification does not exclude the programs from use on later models – it is merely that the publisher does not necessarily state explicitly that his software runs on anything other than BBC micro. See page 145 for an order form.

4mation, Linden Lea, Rock Park, Barnstaple EX32 9AQ. Tel: (0271) 45566

Abacus, 21 Union Street, Ramsbottom, Lancs

ABC Primary Software, 19 Crumstone Court, Killingworth, Tyne and Wear. Tel: 091-268 2627

Acornsoft, Technopark, 645 Newmarket Road, Cambridge CB5 8PD. Tel: (0223) 214411

Addison Wesley, Finchampstead Road, Wokingham, Berks RG11 2NZ. Tel: (0734) 794000

AJ Software, 61 Jeddo Road, London W12 9ED

Ajax, 57 Rowley Street, Walsall WS1 2AZ

Akadamias, UCNW, Bangor LL57 2DG. Tel: 351151 x354

Alan Wiltshire, 12 Barrow Road, Lowestoft NR32 3PN

Alpha Computer School, 33 Chesswood Road, Worthing BN11 2AA. Tel: (0903) 210701

Ampalsoft, 31 Woodbridge Road, Blackwater, Camberley, Surrey. Tel: (0252) 876677

AMS Advanced Memory Systems, 166-170 Wilderspool Causeway, Warrington WA4 6OA. Tel: (0925) 413501

Argus Press, 1 Golden Square, London W1R 3AB. Tel: 01-437 0626

Arnold Wheaton, Parkside Lane, Dewsbury LS5TD

ASK, 32 Bridge Street, Cambridge CB2 1UJ. Tel: (0223) 65445

ATM, Kings Chambers, Queen Street, Derby DE1 3DA

AUCBE, Endymion Road, Hatfield, Herts. Tel: (07072) 65443

AVC, PO Box 415, Harborne, Birmingham B17 0HD

BBC Publications, 35 Marylebone High Street, London W1M 4AA. Tel: 01-580 5577 x 4128

BeeBinEd, The Coach House, Hunsdonbury, Ware SG12 8PW. Tel: (0920) 870508

Beebugsoft, PO Box 50, St Albans, Herts. Tel: (0727) 40303

Beltech, College House, St Leonards Close, Bridgnorth, Salop

BES, Bourne House, The Hundred, Romsey SO5 8BY. Tel: (0794) 523301

Betasoft, 5a St Stephens Road, Cold Norton, Chelmsford CM3 6JE

BP Education, PO Box 5, Wetherby LS23 7EH. Tel: (0937) 843477

Brainstorm, 103a Seven Sisters Road, London N7 7QN. Tel: 01-263 6926

Bridge Software, 103 Hillside Road, Corfe Mullen, Wimborne BH21 3SG

Brit. Inst. of Traffic Ed. Research, Kent House, Kent Street, Birmingham B5 6QF. Tel: 021-622 2402

Bryants, 5 Renfrew Green, Blakelaw, Newcastle upon Tyne NE5 3TY. Tel: 091-286 6146

CALL, Lanchester Poly, Coventry CV1 5FB. Tel: (0203) 24166 x 222

Camant Software, 8 Graigstewart Crescent, Alloway, Ayr KA7 4DB. Tel: (0292) 43492

Cambridge Micro Software, Edinburgh Bldg, Shaftesbury Road, Cambridge CB2 2RN. Tel: (0223) 312393

Cambs Cambridgeshire Software House, Town Hall, St Ives, Huntingdon PE17 4AL. Tel: (0480) 66805

Capital Media, John Ruskin Street, London SE5 0PQ. Tel: 01-735 9123

CCS, 14 Langton Way, Blackheath, London SE3 7TL. Tel: 01-858 0763

Centre for Learning Resources, as Capital Media

Century, 12-13 Greek Street, London W1V 5LE. Tel: 01-434 4241

CET, 3 Devonshire Street, London W1. Tel: 01-580 7553

Chaddington, 14 Selkirk Close, Worthing BN13 1PB. Tel: (0903) 501378

Chalksoft, PO Box 49, Spalding PE11 1NZ. Tel: (0775) 69518

Clares, 98 Middlewich Road, Rudheath, Northwich CW9 7DA. Tel: (0606) 48511

CLASS, 93 Bedwardine Road, London SE19 3AY. Tel: 01-771 2496

Clifton College, Technical Activities Centre, Bristol BS8 3JH

Clwyd Technics, Antelope Industrial Estate, Rhydymwyn, Mold, Clwyd. Tel: (0352) 83751

COIC, Manpower Services, Moorfoot, Sheffield S1 4PQ. Tel: (0742) 704563

Collins, 8 Grafton Street, London W1X 3LA. Tel: 01-493 7070

Complete, 32-38 Osnaburgh Street, London NW1 3ND. Tel: 01-387 9503

Computer Concepts, Gaddesden Place, Hemel Hempstead HP2 6EX. Tel: (0442) 63933

Computercat, 224 Chapel Street, Leigh, Lancs

Comsoft, 67 Kent Road, Harrogate HG1 2NH. Tel: (0423) 57464

Contex, 15 Woodlands Close, Cople, Bedford MK44 3UE. Tel: (023) 03347

Corona, 73 High Road, South Woodford, London

CRAC, Bateman Street, Cambridge CB2 1LZ. Tel: (0223) 354551

Creative Sparks, 296 Farnborough Road, Farnborough GU14 7NU. Tel: (0252) 543333

Daco, 59 Mackenzie Road, Moseley, Birmingham. Tel: 021-449 2253

Database Publications, 68 Chester Road, Hazel Grove, Stockport SK7 5NY. Tel: 061-456 8383

Datapen, Kingsclere Road, Overton, Hants

Dial Software, 72 Downend Road, Downend, Bristol, Avon

Digital Services, 159 Havant Road, Drayton, Portsmouth PO6 2AA. Tel: (0705) 324934

Doctor Soft, 258 Coneygree Road, Peterborough, Cambs. Tel: (0903) 206076

Drake, St Fagan's Road, Fairwater, Cardiff CF5 3A. Tel: (0222) 560444

Earth Science, MJP, Freepost PO Box 23, Faversham, Kent. Tel: (0795) 534690

Ed Tech Services, The Barn, Thorney, Peterborough PE6 0GA. Tel: (0733) 270875

EdSoft, 12 Cotmore Close, Brixham TQ5 0EF Tel: (080 45) 3603

Educated Owl, 62 Airedale Avenue, Tickhill, Doncaster, S Yorks

Educational Admin. Software, Somerville House, Brunswick Road, Withington M20 9GA. Tel: 061-445 1379

Educational Software, 108 Parthenon Drive, Liverpool L11 7AQ

Edward Arnold, 41 Bedford Square, London WC1B 3DQ. Tel: 01-637 7161

Englefield, High House, Mill Street, Buxton, Norwich, Norfolk

Ephagy Software, 125 Corporation Road, Grimsby DN31 1UR. Tel: (0482) 812902

ESM, 32 Bridge Street, Cambridge CB2 1UJ. Tel: (0223) 65445

Fernleaf, 31 Old Road West, Gravesend DA11 0LH. Tel: (0474) 359037

Flite, Conway, County Donegal, Eire

Focusplan, 57 Westgate, Cleckheaton, W Yorks

Foulsham Educational, Yeovil Road, Slough SL1 4JH
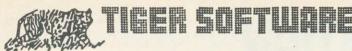
Franklin Watts, 12a Golden Square, London W1R 4BA. Tel: 01-437 0713

Fsoft, PO Box 352, Brighton BN1 3AY. Tel: (0273) 736042

Garland Computing, 35 Dean Hill, Plymouth PL9 9AF. Tel: (0752) 41287

GED, 70 Stoke Road, Bletchley, Bucks

GEM, 1 Oswald Road, Leamington Spa, Warwicks

Gemini, Gemini House, Concorde Road, Exmouth EX8 4RS. Tel: (0395) 265165

Gibsoft, 38-42 Peveril Street, Nottingham

Gifted Children Info Centre, 21 Hampton Lane, Solihull B91 2QJ. Tel: 021-705 4547

Ginn & Co, Prebendal House, Parsons Fee, Aylesbury, Bucks

Glentop, Bath Place, High Street, Barnet, London EN5 1ED. Tel: 01-441 4130

Golem, 77 Qualitas, Bracknell RG12 4QG. Tel: (0344) 50720

Greenwood, Lower Bockhampton, Dorchester DT2 8PZ

Griffin and George, 285 Ealing Road, Alperton, Wembley HA0 1HJ. Tel: 01-497 3344

GSN, 214 Stamford Street, Ashton under Lyne OL6 7LR. Tel: 061-339 6635

H&H, 53 Holloway, Runcorn WA7 4TJ. Tel: (09285) 65566

Hargreaves, Updown, Pewley Way, Guildford, Surrey

Heinemann, Windmill Press, Kingswood, Tadworth KT20 6TG. Tel: (0737) 833511

Herdman, 43 St Johns Drive, Clarborough, Retford DN22 9NN

Highlight Software, 36 Sherbourne Close, Barry CF6 5AQ. Tel: (0446) 745482

Hilditch Software, 4 Church Road, Felixstowe IP11 9NF. Tel: (0394) 271747

Hill MacGibbon, 8 Grafton Street, London W1X 3LA. Tel: 01-493 7070

Himap, 8 Wishart Road, Kidbrooke SE3 8PP

Hodder and Stoughton, Mill Road, Dunton Green, Sevenoaks, Kent

Hutchinson, 62-65 Chandos Place, London WC2N 4NW. Tel: 91-240 3411

Ian Copestake, 23 Connaught Crescent, Brookwood, Woking, Surrey. Tel: (0486) 74755

Ibbotson Design Software, The Byre, Ecclesbourne Lane, Idridgehay DE4 4JB. Tel: (077 389) 658

IEC, 77 Orton Lane, Wombourne, Wolverhampton WV5 9AP. Tel: (0902) 892599

IJK Software, 9 King Street, Blackpool, Lancs

In-Service Systems, 186 Devizes Road, Salisbury, Wiltshire

In-sight, 3 The Witheys, Wanborough, Swindon SN4 0BQ

Innovative Software, 41 Walter Road, Swansea, West Glam

Interface, 9-11 Kensington High Street, London W8

IRL Press, PO Box 1, Eynsham, Oxford OX8 1JJ

ISMeC, Westminster College, North Hinksey, Oxford OX2 9AT

Kingfisher, 16 Martock Road, Keynsham, Bristol BS18 1XA. Tel: (02756) 68152

Kosmos, 1 Pilgrims Close, Harlington, Dunstable, Beds. Tel: (05255) 3942/5406

LCL, 26 Avondale Avenue, Staines, Middx. Tel: (0784) 58771

Learnwell, 152 Westmorland Road, Wyken, Coventry, Warwicks

Letts, Diary House, 77 Borough Road, London SE1 1DW. Tel: 01-407 8891

Linear Graphics, 28 Purdeys Way, Rochford SS4 1NE. Tel: (0702) 541664/5

Logical Software, Scientific House, Bridge Street, Sandiacre, Notts. Tel: (0602) 394000

Logo Software, 316a Richmond Road, Twickenham TW1 2PD. Tel: 01-891 0989

Logotron, 59 Markham Street, London SW3 4ND. Tel: 01-352 1088

Longman, Burnt Mill, Harlow CM20 2JE. Tel: (0279) 26721

LPA, Studio 4, Royal Victoria Pat Building, London SW18 3SX. Tel: 01-871 2016

LTS, Haydon House, Alcester Road, Studley, Warwicks. Tel: (0386) 792617

Macdonand, 74 Worship Street, London EC2A 2EN. Tel: 01-377 4600

Macmillan, Little Essex Street, London WC2R 3LF. Tel: 01-836 6633

Management Data Systems, 108 Parthenon Drive, Liverpool L11 7AQ. Tel: 051-226 1214

McGraw-Hill, Shoppenhangers Road, Maidenhead, Berks. Tel: (0628) 23432

McHugh Enterprises, 43 Hookstone Oval, Harrogate HG2 8QE

MedStat, City House, Maid Marian Way, Nottingham NG1 6BH. Tel: (0602) 411120

MEDUSA, Bishop Grosseteste College, Lincoln LN1 3DY. Tel: (0522) 44713

MegaCyCAL, PO Box 6, Birkenhead L43 6XH. Tel: 051-652 3139

MEI, 41A West Street, Oundle, Peterborough PE8 4EJ. Tel: (0832) 73444

Micro Power, 9-8a Regent Street, Chapel Allerton, W Yorks

Micro-aid, 25 Fore Street, Praze, Camborne, Cornwall

Micro-Jenn, 81 Squirrels Heath Road, Harold Wood, Romford RM3 0LD

Microwave, 24 Belford Road, Stretford, Manchester

Mirrorsoft, 74 Worship Street, London EC2A 2EN. Tel: 01-377 4837

Modular Resources, 12 Ledger Lane, Lofthouse, Wakefield WF1 2PH

MRH, 20 Highfield Road, Kidderminster DY10 2TL

Mupados, Unit 11, Llambed industrial Estate, Lampeter SA48 8LT. Tel: (0570) 422877

MUSE, PO Box 43, Hull HU1 2HD

Musicsoft, 12 Fallowfield, Ampthill, Beds. Tel: (0525) 402701

NEC, 18 Brooklands Avenue, Cambridge CB2 2HN. Tel: (0223) 316644

Nelcal (Nelson), Mayfield Road, Walton on Thames KT12 5PL. Tel: (0932) 246133

Nisbet, Digswell Place, Welwyn, Herts. Tel: (0707) 667183

Nordis, Cornhill Close, Northampton NN5 7UB

Notts CC, Trent Bridge House, Fox Road, Nottingham NG2 6BJ

Notts Ed Suppliers, 17 Ludlow Hill Road, West Bridgford NG2 6BJ

Oertling Avery, Smethwick, Warley B66 2LP. Tel: 021-558 1112

Opalsoft, 112 Arterial Road, Eastwood, Leigh on Sea, Essex

Optima, 68 chester Row, Hazelgrove, Stockport SK7 5NY

Orion Software, 11 Buttercup Close, Harold Wood RM3 0XF

Oxford Microware, 52 St Giles, Oxford OX1 3LU. Tel: (0865) 54505

Oxhey Tutors, 19 Tutor Wall, Watford WD2 4NY

Paean Systems, Quebec House, Little Bealings, Woodbridge IP13 6LT. Tel: (0473) 623757

Page, 17 Pagefield Crescent, Clitheroe BB7 1LH

Pan Books, 18-21 Cavaye Place, London SW10. Tel: 01-373 6070

Pee Bee, 8 Beechwood Road, Chippenham, Wilts

Peter Sharpe, Llwydfan, Minffordd Road, Penrhyndeudraeth LL48 6AU. Tel: (0766) 770528

Philip Harris, Lynn Lane, Staffs WS14 0EE. Tel: (0543) 480077

Pilot One, 22 Campbell Road, Bedford MK40 3DD. Tel: (0234) 327688

Pitmansoft, 128 Long Acre, London WC2. Tel: 01-379 7383

Primary Programs, Claypits, Debden Road, Saffron Walden, Essex

Primasoft, 2 Spinney Close, Glossop, Derbys

Private Tutor, 29 Hollow Way Lane, Amersham HP6 6DJ. Tel: (02403) 21702

Promotional ArtWork Systems, 9 Mayo Close, Leeds LS8 2PX

Psion, Harcourt Street, London W1H 1DT. Tel: 01-723 9408

Quicksilva, 13 Palmerston Road, Southampton SO1 1LL (0703) 220169

Quixtor, 7 Haslemere Avenue, Hale Barns WA15 0AU

RESOURCE, Exeter Road, Doncaster DN2 4PY. Tel: (0302) 63800

Reeves, 24 Carthona Drive, Fleet GU13 9SF. Tel: (02514) 4674

RH Electronics, Chesterton Mill, Frenchs Road, Cambridge CB4 3NP

RJE Software, 143 Montague Road, London E11 3EW

RoSPA, The Priory, Queensway, Birmingham B4 6BS. Tel: 021-223 2461

S&S Schofield & Sims, Dogley Mill, Fenay Bridge, Huddersfield HD8 0NQ. Tel: (0484) 607080

School Software, Meadowvale Estate, Raheen, Limerick, Ireland. Tel: 061-27994

Schoolfax, 24 Somerset Road, Swindon SN2 1NF. Tel: (0793) 695296

Schoolsoft, 19 Shadwell Grove, Radcliffe, Notts

Scisoft, 5 Minster Gardens, Newthorpe, Nottingham NG16 2AT. Tel: 764501

Selective Software, 64 Brooks Road, Street BA16 0PP

SESS, 275-277 Bath Road, Bristol. Tel: (0272) 710103

Shards, 189 Eton Road, Ilford, Essex

Sherston Software, 8 Court Street, Sherston, Malmesbury SN16 0LL. Tel: (0666) 840433

Shumwari Associates, 12 Marlin Court, Marlow SL7 2AJ. Tel: (062 84) 5751

Sigma, as Wiley

Siverlind, 156 Newton Road, Burton-on-Trent, Staffs. Tel: (0283) 63987

Silversoft, Unit 7D Kings Yard, Carpenters Road, London E15 2HD. Tel: 01-985 5614

Simon Hessell, 15 Lytham Court, Sunninghill, Berks

Simonsoft, 25 Tatham Road, Abingdon OX14 1QB

Social Science Software, Freepost, Birkenhead L42 2AB

Soft Warehouse, 285 Oldbury Road, Worcester, Worcs. Tel: (0623) 25307

Square Software, 12a Uplands Terrace, Swansea, W Glamorgan

SRA, Newtown Road, Henley on Thames RG9 1EW. Tel: (0491) 575959

Star Devices, 22 Hyde Street, Winchester SO23 7DR. Tel: (0962) 63626

Storm Software, Newbury Court, Gillingham SP8 4QX. Tel: (07476) 2774

Strawberry Fair, 15 Walker Road, Portsmouth PO2 8PQ. Tel: 697867

Sulis, as Wiley

SUMS, University College of Swansea, Swansea SA2 8PP

Superior Software, 69 Leeds Road, Bramhope, Leeds, W Yorks

Surrey County Council, Highway House, Chessington Road, Epsom KT17 1TT

Synergy, 7 St Andrews Close, Slip End, Luton, Beds

Syntax, 16 Woodburn Drive, Bolton BL1 6NM. Tel: (0204) 47321

SYSTEM, 12 Collegiate Crescent, Sheffield S10 2BA. Tel: (0742) 682321

Taskmaster, Morris Road, Clarendon Park, Leicester LE2 6BR

Tasman Software, 17 Hartley Crescent, Leeds, W Yorks. Tel: (0532) 438301

Tecmedia, 5 Granby Street, Loughborough LE11 3DU. Tel: (0509) 230248

Tectel, Telford ITEC, Halesfield 14, Telford, Salop. Tel: (0952) 581738

Timetable Systems, 39 Somerset Road, Frome BA11 1HD. Tel: (0373) 63749

Toad Educational Computing, 8 Westbourne Grove, Sale M33 1RP. Tel: 061-969 4740

Tom Shipman, PO Box 406, Brentwood CM13 3QE

Tressell, Unit 3, 22 Campbell Road, Brighton BN1 4QD. Tel: (0273) 600186

Tutor Software 58 Kingsdale Park, Belfast BT5 7BZ. Tel: (0232) 796794

Tutorial Software, as Earth Science

Tuxsoft, PO Box 1, Tuxford, Newark NG22 0JY. Tel: (0623) 863952

Unilever Educational, PO Box 68, Unilever House, London EC4P 4BQ. Tel: 01-822 6727

University Software, PO Box 383, London N6 5UP. Tel: 01-883 7155

Viztech, 11 Teasdale Road, Carlisle CA3 0HF. Tel: (0228) 35966

Weaversoft, 22 Lodge Drive, Northwich CW9 8RQ

Wida, 2 Nicholas Gardens, London W5 5HY. Tel: 01-567 6941

Widgit, 48 Durham Road, East Finchley, London N2 9DT. Tel: 01-444 5285

Wigmore House, 32 Savile Row, London W1X 1AG. Tel: 01-734 8826

Wiley Software, Baffins Lane, Chichester PO19 1UD
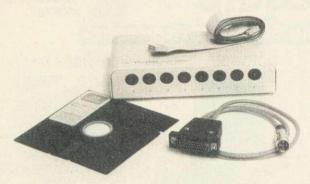
Wilson Software, Freepost, Ormskirk, Lancs. Tel: (0695) 72449

Yorke House, Pendower Hall, West Road, Newcastle Upon Tyne NE15 6PP. Tel: 091-274 3620

EDUCATION SOFTWARE GUIDE

BIOLOGY

TITLE	PUBLISHER	PRICE	MACHINE	AGE	TYPE
16 + Biology	Herdman	£12.95	B	Sec	b
Action of the Heart	Garland	£11.75	B,B + ,Electron	Sec	b,s
Animal Physiology Pack	Longman	£40.25	B,Econet	Sec	b
Bio Wood	Solent	£9	B	J/S	b,s
Biochemistry/Molecular Biology Disc	Garland	£35.25	B	Sec	b
Biochemistry and Plant Physiology	Longman	£40.25	B,Econet	Sec	b
Biology Revision	Abacus	£12.95	B	Sec	b
Biology	Longman	£20	B	Sec	b
Biology 1 & 2	Nelcal	£30.48	B,Econet	Sec	b
Biology	Tom Shipman	£7.99	B,Electron	Sec	b
Biology	School	£12.95	B,Econet	Sec	b
Biomass	Longman	£20.13	B,Econet	Sec	b
Bioscience	IRL	£22.50	B	Sec	b
Blood Circulation	Garland	£11	B,B + ,Electron	Sec	b,s
Blood Sugar	Longman	£20.13	B,Econet	Sec	b
Body Processes and the Fate of Protein	Garland	£10	B	Sec	b
Chromosome Mapping	Garland	£10	B	Sec	b
Compete	Edward Arnold	£15	B	Sec	b
Disease Dodgers	Macmillan	£6.95	B	J/S	b
DNA Structure	Garland	£16.50	B,B + ,Electron	Sec	b
Ecology	Garland	£23	B,B + ,Electron	Sec	b
Enzkin	Edward Arnold	£15	B	Sec	b
Enzyme Kinetics	Edward Arnold	£16	B	Sec	b
Evolution and Natural Selection	Edward Arnold	£16	B	Sec	b
Evolut	Edward Arnold	£15	B	Sec	b
Eye	Longman	£20.13	B	Sec	b
Fantastic Voyage	KA Spencer	£12.95	B	Sec	b
Female Reproduction	Garland	£12	B,B + ,Electron	Sec	b
Female Reproductive Cycle	Longman	£17.83	B	Sec	b
Flowering in Soya Bean	Longman	£20.13	B,Econet	Sec	b,s
Genetic Code	IRL	£22.50	B,B + ,Econet	Sec	b
Genetic Code Mutation	Garland	£15	B,B + ,Electron	Sec	b
Genetics Disc	Garland	£31.75	B	Sec	b
Genetics "A"	Akadamias	£9.95	B,Econet	Sec	b
Genetics with Budgerigars	Edward Arnold	£26.50	B	Sec	b
Glycolysis	Garland	£15	B,B + ,Electron	Sec	b
Graphic Biology – Nerve Impulse	Longman	£20.13	B	Sec	b
Growth of Microbes	Longman	£17.83	B	Sec	b
Heart & Kidney	Garland	£11.26	B,B + ,Electron	Sec	b
Heredity	Longman	£40.25	B,Econet	Sec	b
Human Blood Groups	Garland	£12	B,B + ,Electron	Sec	b
Human Biology 1 & 2	Garland	£31.75	B,B + ,Electron	Sec	b
Human Energy	Longman	£20.13	B,Econet	Sec	b
Inheritance	Garland	£11.75	B,B + ,Electron	Sec	b
Introductory Genetics	Garland	£17.25	B	Sec	b
Kidney Nephron	Longman	£20.13	B	Sec	b
Lake Web	Solent	£12	B	J/S	b,s
Leaves	Heinemann	£13.80	B	J/S	b,x
Metabolic Pathways	Longman	£20.13	B,Econet	Sec	b,s
Microcomputers in Biology	IRL	£61.19	B,Econet	Sec	b,ll
Microdiet	Longman	£31.63	B,Econet	Sec	b,ff
Moths, Mice and Other Beasties	Longman	£20.13	B	Sec	b
Multifactorial Inheritance	Longman	£20.13	B,Econet	Sec	b
Muscle Contraction	IRL	£22.50	B,B + ,Econet	Sec	b
Naming Organic Compounds	Longman	£28.75	B	Sec	b,c
Nerve Impulse	Longman	£20.13	B	Ju	b
Nucleic Acid Structure	IRL	£25.08	B,B + ,Econet	Sec	b
Photosynthesis	IRL	£25.08	B,B + ,Econet	Sec	b
Photosynthesis	Longman	£14.50	B,Econet	Sec	b
Photosynthesis	Garland	£16.50	B,B + ,Electron	Sec	b
Physiological Simulation	Heinemann	£20.12	B	Sec	b
Plant Biology Disc	Garland	£34.50	B	Sec	b
Plant Competition	Edward Arnold	£16	B	Sec	b
Plant Ecology	Earth Science	£15	B	Sec	b,ii
Pond Animals	Heinemann	£10.93	B	J/S	b,x
Pond Ecology	Longman	£20.13	B,Econet	Sec	b
Population Dynamics	Edward Arnold	£16	B	Sec	b,ii
Population Genetics	Garland	£15	B,B + ,Electron	Sec	b
Prey	Longman	£20.13	B,Econet	Sec	b
Protein Puzzle	Garland	£11.75	B,B + ,Electron	Sec	b
Protein Structure	IRL	£22.50	B,B + ,Econet	Sec	b,c
Relationships	BBC	£17.20	B	Sec	b,s
Seed Germination	Garland	£16.50	B,B + ,Electron	Sec	b
Suburban Fox	Ginn & Co	£36.80	B	J/S	b,s
Super Seed	Cambridge Micro	£11.71	B	J/S	b
Synthesis of Ammonia	Edward Arnold	£13.04	B	Sec	b
Transpiration	Garland	£10	B	Sec	b
Water relations	Garland	£11	B,B + ,Electron	Sec	b

CHEMISTRY

TITLE	PUBLISHER	PRICE	MACHINE	AGE	TYPE
16 + Chemistry	Herdman	£12.95		Sec	c
Acid-Alkali Titrations	Nelcal	£24.50	B,Econet	Sec	c
Advanced Physical Chemistry	Herdman	£12.95	B	Sec	c
Advanced Inorganic Chemistry	Herdman	£12.95	B	Sec	c
Atoms and Moles	Griffin	£9.95	B	Sec	c
Balance Monitor	Oertling Avery	£40	B	Sec	c,b,p
Balancing Equations	Longman	£18.34	B,Econet	Sec	c
Bonding	BBC	£17.20	B	Sec	c
Can we trust the breathalyser?	Modular	£37.50	B	Sec	c,p,b
Cars – Maths in Motion	Cambs Software	£18	B		
Chemi Plant	H & H	£7.50	B	Sec	c,s
Chemical Analysis	Acornsoft	£10.20	B	Sec	c
Chemical Collisions	Cambridge Micro	£17.80	B,Econet	Sec	c
Chemical Database	Longman	£21	B	Sec	c,dd
Chemical Element	Longman	£20.13	B,Econet	Sec	c
Chemical Calculation	Ardsoft	£6	B	Sec	c
Chemical Equations	Garland	£12.95	B,B + ,Electron	Sec	c
Chemical Structures	Acornsoft	£10.20	B	Sec	c
Chemical Kinetics	Heinemann	£16	B	Sec	c
Chemical Reaction Kinetics	GSN	£14.38	B	Sec	c,s
Chemical Simulations	Acornsoft	£10.20	B	Sec	c,s
Chemistry Disc	Garland	£34.50	B	Sec	c
Chemistry "A"	Longman	£28.75	B,Econet	Sec	c
Chemist	MUSE	£9	B	Sec	c
Chemistry	Micro Power	£6.95	B	Sec	c
Chemistry Problem	Garland	£30	B,B + ,Electron	Sec	c
Chemistry Revision	Abacus	£12.95	B	Sec	c
Chemistry Software	Pitman	£22.94	B	Sec	c
Chemistry Pack	Longman	£23	B	Sec	c
Chemistry	School	£12.95	B,Econet	Sec	c
Compounds	Longman	£20.13	B,Econet	Sec	c
Crystal Structure	Earth Science	£12.95	B	Sec	c,p
Crystals	Earth Science	£13.95	B	Sec	c,g
Dynamic NMR	Microwave	£9.50	B	Sec	c
Elements and Compounds	Garland	£11	B,B + ,Electron	Sec	c
Forensic	AVC	£3	B,B +	Sec	c
Forensic	Chalksoft	£17.50	B	Sec	c
Formulae Game	Longman	£20.13	B	Sec	c
Formula Package	Cloud 9	£8.50	B	Sec	c
Formulae and Compounds	Griffin	£9.95	B	Sec	c
Gas Chromatography	Longman	£20.13	B,Econet	Sec	c,cc
Gas Expansion	Garland	£11	B,B + ,Electron	Sec	c
Gas Laws	Longman	£20.13	B	Sec	c
Homogenous Equilibrium	Longman	£20.13	B,Econet	Sec	c
How can you make a material with thousands of uses?	Modular	£37.50	B	Sec	c
How can we reduce the world food shortage?	Modular	£37.50	B	Sec	c
How did Early Chemists predict unknown elements?	Modular	£37.50	B	Sec	c
How did 14th cent. glaziers produce coloured glass?	Modular	£37.50	B	Sec	c
Industrial Chemistry Pack	Longman	£28.75	B	Sec	c
Inorganic Analysis	Garland	£12.95	B,B + ,Electron	Sec	c
Introducing Science	CET	£7	B	Ju	c
Minerals	Earth Science	£13.95	B	Sec	c,g
Mole Concept	BBC	£13.04	B	Sec	c
Moving Molecules	Cambridge Micro	£15.95	B,Econet	Sec	c,s
Nelson Advanced Chemistry	Nelcal	£30.48	B	Sec	c
Organic Analysis	Longman	£20.13	B,Econet	Sec	c
Organic Synthesis	Longman	£20.13	B	Sec	c
Passit Inchem	Ed Soft	£7.95	B	Sec	c
Passit Redox	Ed Soft	£5.95	B	Sec	c
Periodic Table of the Elements	Peter Sharpe	£4.95	B	Sec	c
Periodic Properties	Hodder	£22.43	B	Sec	c
Physical Chemistry Pack	Longman	£34.50	B	Sec	c
Polymers	BBC	£23	B	Sec	c
Qbank Chemistry	In-sight	£30	B	Sec	c,hh
Rates of Reaction	Longman	£20.13	B,Econet	Sec	c
Reaction Maze	Nelcal	£24.50	B,Econet	Sec	c
Secondary Science	Heinemann	£13.80	B	Sec	c,p,b
Science	Shards	£6.95	B,Electron	Sec	c
Stoichiometry of Ionic Compounds	Nelcal	£24.50	B,Econet	Sec	c
Symbols Formulae and Valency	Garland	£12.95	B	Sec	c
The Arrhenius Equation	Nelcal	£24.50	B,Econet	Sec	c
The Periodic Table	BBC	£23	B	Sec	c
The Zantmann Experiment	Nelcal	£24.50	B,Econet	Sec	c
Titrations	SYSTEM	£14.95	B,Econet	Sec	c
Titrations	Arnold Wheaton	£16.10	B	Sec	c
Titration Package	Cloud 9	£8.50	B	Sec	c
Water Treatment	Longman	£17.83	B	Sec	c
What happens when the oil runs out?	Modular	£37.50	B	Sec	c,g
What is a star	Modular	£37.50	B	Sec	c,p,z
What caused the Whitside Downs Disaster?	Modular	£37.50	B	Sec	c,s
Which Salt	Micro Power	£6.95	B,Electron	Sec	c
Which Compound	Cloud 9	£8.50	B	Sec	c

ECONOMICS/BUSINESS

TITLE	PUBLISHER	PRICE	MACHINE	AGE	TYPE
Accounts 1 & 2	Heinemann	£20.12	B	Sec	d
Airline	Cases	£6.95	B	J/S	d,s
Balance of Payments	Longman	£20.13	B	Sec	d
Basic Macroeconomic Models	Longman	£28.75	B	Sec	d
Break Even	Longman	£20.13	b	Sec	d
Business games	Acornsoft	£9.95	A,B,Electron	Sec	d
Cash Book	Pitman	£22.94	B	Sec	d
Circular Flow of Income	Longman	£20.13	B	Sec	d
Discounted Cash Flow	Social Science	£15	B	Sec	d
Domestic Heating	Longman	£20.13	B,Econet	Sec	d

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ACORN USER MAY 1986

EDUCATION

TITLE	PUBLISHER	PRICE	MACHINE	AGE	TYPE
Economics "A"	Akadamias	£9.95	B,Econet	Sec	d
Economics	Sigma	£25	B	Sec	d
Economics	Longman	£14.50	B	Sec	d
Egg Production	Crystal	£25	B	J/S	d,s
Election Programme	Social Science	£39.50	B	Sec	d
Energy Crisis	Social Science	£15	B	Sec	d
Equi-marginal Utility	Longman	£20.13	B	Sec	d
Estate agent	Longman	£14.50	B	Sec	d
Farmer	Longman	£14.50	B	Sec	d,s
Fixed Exchange Rates	Longman	£14.50	B	Sec	d
Food and Population	BBC	£23	B	Sec	d
Forecast	Acornsoft	£11.90	B	Sec	d
Forecaster	Collins	£19.95	B	Sec	d
GB Ltd	Simon Hessel	£5.13	B	Sec	d
Heating Costs	BBC	£10	B	Sec	d
Hot Cakes	Private Tutor	£7.95	B,Electron	Sec	d
Hotel	Pitmansoft	£22.94	B	Sec	d,s
Inkosi	Chalksoft	£6.95	B	Ju	d
Intervention	SYSTEM	£115	B,Econet	Sec	d,s
Introduction to Microeconomics	Pitmansoft	£57.44	B	Sec	d
Introduction to Economics	University Software	£40	B,Electron	Sec	d
Iron and Steel Locations	Longman	£20.13	B	Sec	d
Living on a Low Budget	Ed Tech	£24.95	B	Sec	d
Macroeconomic Database	Longman	£45.94	B	Sec	d,dd
Making Ends Meet	Cambridge Micro	£16.50	B,Econet	Sec	d
Malthus	Longman	£20.13	B,Econet	Sec	d
Measuring Price Electricity	Longman	£14.50	B	Sec	d,s
Merger	Longman	£14.50	B	Sec	d
Mini Office	Database	£5.95	B	Sec	d
Payslip	Pitman	£45.94	B	Sec	d
Point of Sale	Heinemann	£48	B	Sec	d
Population	CET	£13.95	B	Sec	d
Population Growth	Cambridge Micro	£15.95	B,Econet	Sec	d
Poverty and Income in Britain	Longman	£46	B	Sec	d,nn
Price Discrimination	Longman	£20.13	B	Sec	d
Riding School	Ginn & Co	£34.50	B	J/S	d,s
Road User Insurance	Notts County Council	£11	B	J/S	d,s
Running the British Economy	Longman	£34.44	B	Sec	d
Sideline	Private Tutor	£7.95	B,Electron	Sec	d
Stock	Arnold Wheaton	£16.10	B	Sec	d
Teddytronics	Longman	£20.13	B	Sec	d
Tick Tack	Primrose	£150	B	Sec	d
Transpots	Longman	£28.75	B,Econet	Sec	d,m
Understanding Economics	Longman	£45.94	B	Sec	d
Unisim	Unilever	£35	B	Sec	d
Workers and Machines	Longman	£20.13	B	Sec	d
Yes Chancellor	Chalksoft	£17.50	B	Sec	d

ENGLISH

TITLE	PUBLISHER	PRICE	MACHINE	AGE	TYPE
Adventure Text (Walsall Adventure Board needed)	RESOURCE	£8.95	B	Special	e
Adventurous English	Highlight	£5.95	B	J/S	e
Adventure Storywriter	ESM	£11	B	Ju	e
Anagram	Ed Soft	£4.95	A,B,B+	I/J	e
Animal Vegetable Mineral	Arnold Wheaton	£9.95	B	J/S	e
Antony and Cleopatra	Akadamias	£9.95	B,Econet	Sec	e
Audio	SESS	£8	B	Special	e
Back Home	Wida	£31.63	B,Econet	I/J	e
Branching Story	Macmillan	£17.25	B	Sec	e
C Rules	Ed Soft	£5.95	A,B,B+	Inf	e
Call my Bluff	Macmillan	£17.25	B	Sec	e
Call Your Bluff	Square	£7	B	Inf	e,m
Castle and Clowns	Macmillan	£7.99	B	Inf	e
Chaucer Prologue	Akadamias	£9.95	B,Econet	Sec	e
Children from Space	ASK	£9.95	B,Electron	Ju	e,v
Cleverclogs	Computertutor	£6.50	B	Ju	e,q
Clown	Englefield	£6.25	B	Ju	e,v
Cloze	Wida	£28.75	B,Econet	Teacher	e,jj
Communication	Britannica	£75	B	J/S	e,ee
Crossed Words	Aztec	£6.50	B,B+	I/J	e
Dictionary	Daco	£13	B	Ju	e
Dictionary	Highlight	£9.95	B	I/J	e
Ding Dong	Nisbet	£8.05	B	I/J	e
Early English Extra	Nisbet	£12.59	B	I/J	e
Early Reading	ESM	£11.95	B	I/J	e
Early Language	SESS	£8	B	Special	e
Easywrite	SYSTEM	£10	B	J/S	e
Educational 1&2	Golem	£6.95	B,Electron	I/J	e,m
English Language Assessment Pack	In Service Systems	£45	B	EFL	e
Englishskills	Griffin	£11.95	B	Sec	e
English Literature	Akadamias	£9.95	B	Sec	e
Entertaining English	Highlight	£11.95	B	Ju	e
File Maker	Kingfisher	£7.50	B	I/J	e
Flowers of Crystal	4mation	£16	B,B+	Ju	e,s
Fol de rol	Sulis	£9.95	B	I/J	e,q
Fun with Words	Golem	£6.95	B,Electron	I/J	e
Gerard Manley Hopkins	Akadamias	£9.95	B,Econet	Sec	e
Gobbledegook	Chalksoft	£9.25	B	Sec	e
Going Places	Widgit	£40.25	B	Special	e,m
Grammar Tree	Sulis	£10.95	B	Sec	e
Granny's Garden	4mation	£13.80	B,B+	Ju	e
Hamlet	Akadamias	£9.95	B,Econet	Sec	e
Hangman	Micro-aid	£7.95	B	I/J	e
Hangman Player	Square	£7	B	Ju	e
Henry IV Part 1	Akadamias	£9.95	B,Econet	Sec	e
Initial Consonants	Drake	£8	B	I/J	e
Joint Matriculation Board Poems	Akadamias	£9.95	B,Econet	Sec	e

TITLE	PUBLISHER	PRICE	MACHINE	AGE	TYPE
Jumbles	Bryants	£5.10	B,B+	Ju	e
Junior Hangman	Square	£7	B	Ju	e
Junior Word Splits	Sulis	£9.95	B	Ju	e
Language Development	LTS	£12.95	B,B+,Econet	J/S	e
Laser Letters	Shards	£6.95	B	I/J	e
Letra	MUSE	£12	B	J/S	e
Lingo	Complete	£12.95	B	J/S	e
Look it Up	GED	£4.50	B	Ju	e
Mallory	MUSE	£4.50	B	J/S	e
Mansfield Park	Akadamias	£9.95	B,Econet	Sec	e
Masterbard	Sulis	£12.95	B	Sec	e
Mastercab	Byants	£5.10	B	Ju	e,q
Meaning Maker 1-4	Monitor	£10	B	Inf	e
Medlibs	Contex	£9.50	B	J/S	e
Micro Stories	Wida	£23	B,Econet	I/J	e
Micro Verse	Wida	£23	B,Econet	I/J	e
Micro English	LCL	£24.50	B,B+,Electron	Sec	e
Microstory	ESM	£11	B	Ju	e
Nouns	Sulis	£7.35	B	Sec	e
Open Sesame	Sulis	£9.95	B	I/J	e
oze	AUCBE	£13.80	B	J/S	e
Picture Spell	GED	£5	B	I/J	e
Play with Words	Pee Bee	£8.50	A,B	Ju	e
Podd	ASK	£9.95	B,Electron	I/J	e,v
Police – Language in Evidence	Cambs Software	£20	B	J/S	e
Puncman 1,2,3&4	Chalksoft	£9.25	B,Electron	Ju	e
Punctuation 1&2	Bryants	£5.10	B,B+	J/S	e
Rape of the Lock and The Epistle to Arbuthnot	Akadamias	£9.95	B	Sec	e
Readamatics	Longman	£28.75	B	Sec	e
Scenes Suite	Page	£15	B	Inf	e
Sentence Builder	ESM	£14.89	B	I/J	e
Sentence Sequencer	Acornsoft	£15.35	B,Electron	Ju	e
Sentence Shaker	GED	£4.50	A,B	Ju	e
Sentence Starter	Educated Owl	£9.50	A,B	Ju	e
Sentence Construction	SESS	£8	B	Special	e
Sentence Construction	Darwood	£4.50	A,B	Ju	e
Sentences	Sulis	£7.35	B	Sec	e
Sentence Maker	Educational Software	£23	B	I/J	e
Sequence	Solent	£8	B	I/J	e
Shipwrecked	Logical	£7.50	B	Ju	e
Similes	AVC	£3	A,B	J/S	e
Sixgam	Pitman	£29.84	B	Sec	e
Snapple Hopper	Macmillan	£7.99	B	Inf	e
Speechparts	Bryants	£5.10	B,B+	Sec	e
Speedread English	Wida	£22.43	B,Econet	Sec	e
Spell	SESS	£8	B	Special	e
Spellbound	Sulis	£9.95	B	I/J	e
Spellcheck	Ed Soft	£4.95	A,B,B+	J/S	e
Spelling	Soft Centre	£6.90	A,B	J/S	e
Spelltest	Bryants	£5.10	B,B+	J/S	e,q
Stable	Englefield	£6.25	B	Ju	e
Starspell	MUSE	£8	A,B,B+	J/S	e
Story	Daco	£14.50	B	Ju	e
Story	H&H	£7.50	B	Inf	e
Story	Chalksoft	£7.95	B	Ju	e
Storybuilder	Bryants	£5.10	B,B+	Ju	e
Storyline	Daco	£7.95	B	Ju	e
Storywriter	ESM	£12.65	B	Ju	e
Stspell B	MUSE	£9	B,B+	Sec	e
Superspell	Aztec	£5.50	B,B+	Ju	e
Talkback	Acornsoft	£9.95	B	J/S	e
Telebook	4mation	£20.30	B,B+	Ju	e,aa
Terrible Tales	Longman	£12.59	B	Ju	e
Text	MUSE	£8	B,B+	Sec	e
The Circus	Sherston	£13.80	B	Inf	e,m
The Establishment	Logical	£7.50	B	Ju	e
The Garden	Clares	£6.95	B,B+	I/J	e
The Tempest	Akadamias	£9.59	B,Econet	Sec	e
The Trumpet Major	Akadamias	£9.95	B,Econet	Sec	e
Top and Tails	Macmillan	£7.99	B	Inf	e
Town	Cambs Software	£10	B	I/J	e
Watching the Street	Gibsoft	£4.65	B	Ju	e
Where/We're, Wear/There, They're/Their	Primary Programs	£5.95	B	J/S	e
Wilde – The Importance of Being Earnest	Akadamias	£9.95	B,Econet	Sec	e
Wilt	Longman	£12.59	B	Sec	e
Wonderwords	Tom Shipman	£7.99	B	Ju	e
Word Hunt	Acornsoft	£15.35	B,Electron	J/S	e
Word Sequencing	Acornsoft	£15.35	B,Electron	Ju	e
Word Skill	Chalksoft	£14.25	B	J/S	e
Word Tray Wizard	Hill MacGibbon	£6.95	B	J/S	e
Wordchaser	Tom Shipman	£7.99	B,Electron	Ju	e
Wordflash	Ed Soft	£4.95	A,B,B+	I/J	e
Wordfrog	Educated Owl	£7.50	B	Ju	e
Wordgames	Griffin	£9.95	B	Ju	e
Wordhang	BES	£8.97	B,B+,Electron	I/J	e
Wordline	Aztec	£3	B,B+	Ju	e
Wordmaster	RH Electronics	£9.95	B	J/S	e
Wordpower	Sulis	£9.95	B	J/S	e
Words and Pictures	Chalksoft	£11.25	B	Ju	e
Words words words	ASK	£9.95	B,Electron	Ju	e
Wordspell	Griffin	£9.95	B	Ju	e
Wordsquares	MUSE	£6	B,B+	J/S	e

GEOGRAPHY/GEOLOGY

TITLE	PUBLISHER	PRICE	MACHINE	AGE	TYPE
Bearings	Bryants	£5.10	B,B+	Sec	g
Britain	Datapen	£5.95	B	Sec	g,q

EDUCATION

TITLE	PUBLISHER	PRICE	MACHINE	AGE	TYPE
British Cities	Schoolsoft	£8	B	J/S	g,q
Capitals	Square	£7	B	J/S	g,q
Cargo	Macmillan	£6.95	B	J/S	g,s
Cellmap	Earth Science	£12.95	B	Sec	g,u
Clifton College Satellite Project	Clifton College		B	J/S	g,i
Climate	Heinemann	£20.12	B	Sec	g,cc
Climate	CET	£14.38	B	Sec	g
Climates	Longman	£23	B	Sec	g
Contour Maps and Cross Sections	Longman	£20.13	B	Sec	g
Contours/Places	Primary Programs	£5.95	A,B,B+	J/S	g
Coucapcur	Ed Soft	£4.95	A,B,B+	Ju	g,q
Counties	Bryants	£5.10	B,B+	J/S	g
Countries	Hewson	£7.95	B	Sec	g
Developing Cities	Nelcal	£30.48	B,Econet	Sec	g
Drainage Basin Morphometry	Longman	£20.13	B	Sec	g
Europe	Himap	£6.50	B,Electron	J/S	g
Europe	Paean Systems	£6.50	B	Sec	g
Europe Rally	Tom Shipman	£7.99	B,Electron	J/S	g,q
European Knowledge	Micro Power	£6.95	B,Electron	Sec	g
European Studies	Aztec	£6.50	B,B+	Sec	g
Food, Farming and Famine	Nelcal	£24.50	B	Sec	g,d
GB Geography	Primasoft	£6.95	B	J/S	g
Geochemical Simulation	Earth Science	£13.95	B	Sec	g,c
Geography/Environmental Studies	Scisoft	£6.95	B	J/S	g,ii
Geodata	Earth Science		B	Sec	g
Geography	Corona	£5	B	Sec	g
Geography	Tutorial	£11.95	B,Electron	Sec	g
Geography 'A'	BBC	£11	B	U/S	g
Geography	Garland	£10	B	Sec	g
Geography	School	£12.95	B,Econet	Sec	g
Geographer's Tool Kit	Earth Science	£14.95	B	Sec	g
Geomorphology	Earth Science	£15	B	Sec	g
Glaciers	Himap	£9.50	B	Sec	g
Gridrefs	Himap	£6	B,Electron	J/S	g
Grids and Maps	Earth Science	£13.95	B	Sec	g
Hatfield Geography	Longman	£28.75	B,Econet	Sec	g
Hills	Longman	£14.50	B	Sec	g
Identify Europe	Kosmos	£7.95	B	Sec	g
Introducing Map Skills	Cambridge Micro	£15.95	B,Econet	Sec	g
Introducing Geography	BBC	£20	B	J/S	g
Italy	Corona	£5	A,B	J/S	g
Let's Explore London/Paris	Cambs Software	£10	B	J/S	g
Linmap	Linear Graphics	£22.42	B	Sec	g,gg
Locate an Oil Rig	Nelcal	£24.50	B	Sec	g
Locate an Industry	Nelcal	£24.50	B	Sec	g
Map Rally	BES	£8.97	B,B+,Electron	Ju	g
Map References	Logical	£7.50	B	J/S	g
Map Skills	CET	£13.95	B	Sec	g
Mapfax	S&S	£19.49	B	Ju	g
Maps and Landscapes 1	Chalksoft	£17.50	B	Sec	g
Meandering Mississippi	Earth Science	£13.95	B	Sec	g
Met Maps	Garland	£13.51	B	Sec	g,gg
Micro Map 1 & 2	Longman	£44.85	B	J/S	g
Micro Mapping	Nelcal	£22.42	B	Ju	g
Motorway Route	Longman	£20.13	B,Econet	Sec	g
Oilstrike	Macmillan	£6.95	B	J/S	g
Ordnance Survey	Himap	£8	B	J/S	g
OS Quiz	Arnold Wheaton	£6	B	Sec	g
Patterns of Underdevelopment	Nelcal	£30.48	B,Econet	Sec	g,d
Peak District	RESOURCE	£9.95	B	Sec	g
Pirate	Chalksoft	£9.25	B	Ju	g
Plate Tectonics	Earth Science	£13.95	B	Sec	h
Predicting Journey Patterns	Longman	£20.13	B	Sec	g
Prospecting Game	Longman	£20.13	B	Sec	g
Rice	Longman	£20.13	B,Econet	Sec	g,d
Quake!	Earth Science	£12	B	Sec	g
Quakes	Solent	£9	B	Sec	g
Rail	Longman	£22	B	Sec	g
River Water Control	Longman	£20.13	B	Sec	g
Rock Soft	Earth Science	£17.95	B	Sec	g
Round the World	Ginn	£34.50	B	Ju	g
Sea Cliff Erosion	Cambridge Micro	£16.50	B,Econet	Sec	g
Sea Wall Defences	Longman	£20.13	B	Sec	g
Secondary Geography	Hutchinson	£24	B	Sec	g
Serpent's Lair	Comsoft	£4.95	B,Electron	J/S	g
Silicate Materials	Earth Science	£13.95	B	Sec	g,c
South Eastern Railway Game	Longman	£20.13	B,B+	Sec	g
Spurn Head	Earth Science	£13.95	B	Sec	g
Topomap	Earth Science	£25	B	Sec	g
Tourism	Nelcal	£30.48	B,Econet	Sec	g
Towns of Great Britain	Aztec	£6.50	B	J/S	g
Towntest	Silverlind	£6.50	B	Sec	g,q
Travel	Heinemann	£33	B	Ju	g
Urban Geography Pack	Longman	£40.25	B	Sec	g
Water on Land	Longman	£20.13	B,Econet	Sec	g,s
Weather	Heinemann	£33	B	Ju	g
Weather Station	Arnold Wheaton	£9.95	B	Sec	g
Weather Forecasting	Longman	£23	B	Sec	g
Weather Chart	Paean	£9.50	B	Sec	g
Weather Ship Oscar	Earth Science	£13.95	B	Sec	g
Weathermaster	Macmillan	£6.95	B	J/S	g
Where?	Micro Power	£6.95	B,Electron	J/S	g,q
Wildcat!	Earth Science	£13.95	B	Sec	g
Windmill Game	Longman	£20.13	B,Econet	Sec	g
Winds	Longman	£14.50	B,Econet	Sec	g
World Geography	MicroPower	£6.95	B	J/S	g,q
World Map	Himap	£6.50	B,Electron	J/S	g
Worldwise	BES	£8.97	B	J/S	g

TITLE	PUBLISHER	PRICE	MACHINE	AGE	TYPE
HISTORY					
1914	Cambridge Micro	£15	B,Econet	Sec	h,s
American West	Longman	£20.13	B	Sec	h
Archaeology	Cambs Software	£13	B	Sec	h
Attack on the Somme	Tressell	£13.99	B	Sec	h,s
British History 1714-1815	Akadamias	£9.95	B,Econet	Sec	h
Campaign	Longman	£20.13	B	Sec	h,s
Canal Building	Longman	£20.13	B	Sec	h
Castle Pack	RESOURCE	£15.95	B	J/S	h
Dinosaurs	Cambs Software	£16	B	Inf	h
Disraeli	Longman	£20.13	B	Sec	h
Eighteenth Century Europe	Akadamias	£9.95	B,Econet	Sec	h
England in the Age of Total War	Akadamias	£9.95	B,Econet	Sec	h
Europe 1870-1950	Akadamias	£9.95	B,Econet	Sec	h
Europe 1789-1870	Akadamias	£9.95	B,Econet	Sec	h
Europe in the Seventeenth Century	Akadamias	£9.95	B,Econet	Sec	h
Fletcher's Castle	Fernleaf	£9.95	B	Ju	h,s
History Revision	Abacus	£12.95	B	Sec	h
History Quiz	Acornsoft	£12.65	B,B+	Sec	h,q
How We Used To Live 1902-1926 and 1926-1953	Fernleaf	£30	B	J/S	h
Mary Rose	Ginn & Co	£32.50	B	J/S	h,s
Micro-History	Hodder	£6.90	B	Sec	h
Murder	Longman	£20.13	B	Sec	h
Nineteenth Century England	Akadamias	£9.95	B,Econet	Sec	h
Norman England	Fernleaf	£31.26	B	J/S	h,s
Palestine 1947	Longman	£20.13	B	Sec	h
Railway Drama	Fernleaf	£31.26	B	J/S	h,s
Renaissance Europe	Akadamias	£9.95	B,Econet	Sec	h
Shallow Hill	Longman	£20.13	B	Sec	h
Sir Francis Drake Adventure Game	LCL	£6.50	B,Electron	J/S	h,s
Stuart England	Akadamias	£9.95	B,Econet	Sec	h
The Black Death	Longman	£28.75	B	Sec	h
The French Revolution	Akadamias	£9.95	VB,Econet	Sec	h
The Saxons	Garland	£13.23	B	Ju	h
The Somme	Tressell	£8.50	B	Sec	h,s
The Victorians	Fernleaf	£22.95	B	J/S	h
Time Traveller	Sulis	£9.95	B	J/S	h,q
Time Traveller's London	GSN	£28.75	B	J/S	h,s
Tudor England	Akadamias	£9.95	B,Econet	Sec	h
Viking England	Fernleaf	£31.26	B	J/S	h,s
MUSIC					
Aural 5	Longman	£20.13	B	Sec	k
Beep-beep	IJK	£4.50	B	I/J	k
Carousel	Schoolsoft	£5	B	Ju	k
Envelope Generator	SYSTEM	£7	B	Sec	k
Music	BBC	£10	B	Sec	k
Music Editor	SYSTEM	£9	B,B+	Sec	k
Music Maestro	Promotional ArtWork	£12.50	B	Sec	k
Music System	SYSTEM	£29.95	B,Econet	Sec	k
Music	Garland	£9.96	B	Sec	k
Music Maker	Fsoft	£10.35	B	Sec	k
Music Theory	Longman	£28.75	B	Sec	k
Music Box	Sherston	£10	B	J/S	k
Musical Relationships	Primary Programs	£9.95	B	Sec	k
Music Quiz	Acornsoft	£12.65	B,B+,Electron	Sec	k,q
Note Invaders	Chalksoft	£14.25	B,Electron	Ju	k
Passit Music Tutor	Ed Soft	£9.95	A,B	Sec	k
Practise and Play	Arnold Wheaton	£22.84	B	J/S	k
Reading Music Grade I	Ardsoft	£31	B	J/S	k
Recorder Tutor	Mupados	£25	B	J/S	k
Recorder Duet Pack	Mupados	£5.75	B	J/S	k
Rhythm and Pitch	Chalksoft	£11.25	B	Sec	k
Solfatu	MUSE	£9	B,B+	J/S	k
Synth	Musicsoft	£8.75	B	Sec	k
The Ensemble Pack	Mupados	£7.50	B	J/S	k
LANGUAGES					
A Vous la France	BBC	£15.50	B,B+	Sec	l
Ausweis: Mit dem Bus	Macmillan	£15	B	Sec	l
Autoevaluacion	Wida	£28.75	B,Econet	Sec	l
Bati-texte	Wida	£28.75	B,Econet	Sec	l
Centre Ville	Chalksoft	£17.50	B	Sec	l
Closemaster	Wida	£28.75	B,Econet	Sec	l,aa
Comprenez	Heinemann	£20.12	B	Sec	l,q
Das Schloss	Chalksoft	£9.25	A,B	Sec	l,q
Deutsch Direkt	BBC	£19.95	B	Sec	l
Didacticiel	Wida	£28.75	B,Econet	Sec	l,ii
Die Prinzessin	Aztec	£6.50	B,B+	Sec	l,q
Ecce Romani	Longman	£20.13	B	Sec	l
Eiffel Tower	Chalksoft	£9.25	B,Electron	Sec	l,q
French	Acornsoft	£11.05	B	Sec	l
French	Micro-aid	£7.95	B	Sec	l
French	AVC	£3	B,B+	Ju	l
French Connections	Cambridge Micro	£16.74	B,Econet	Sec	l
French Vocab	Hargreaves	£6.50	B	J/S	l
French Mistress	Kosmos	£7.35	B,B+,Electron	Sec	l
French Copywrite	ESM	£14.89	B	Sec	l
French Verbs	Primary Programs	£9.95	B	Sec	l
French 1&2	Macmillan	£17.25	B	Sec	l
French on the run	Silversoft	£9.95	B	Sec	l,s
Gapkit European Languages	Wida	£23	B,Econet	Sec	l
German Master	Kosmos	£7.35	B,B+,Electron	Sec	l
German	Macmillan	£17.25	B	Sec	l
German	Acornsoft	£11.05	B	Sec	l

EDUCATION

TITLE	PUBLISHER	PRICE	MACHINE	AGE	TYPE
German Sentence	Educated Owl	£9.50	B	Sec	l
German Copywrite	ESM	£14.89	B	Sec	l
German Routines	Wida	£17.25	B,Econet	Sec	l
Granville	Cambridge Micro	£16.74	B,Econet	Sec	l,s
Incendie a l'hotel	Wida	£20.13	B,Econet	Sec	l
Irregular Verbs	Carsondale	£15.99	B	Sec	l
Italian	Acornsoft	£11.05	B	Sec	l
Jeu des Menages	Cambridge Micro	£17.80	B,Econet	Sec	l
Just a Mot	Sulis	£9.95	J/S		l
Kopjager	Cambridge Micro	£17.80	B,Econet	Sec	l
La Conjugaison	MedStat	£12.50	B	Sec	l
La Princesse	Aztec	£6.50	B,B+	J/S	l
Le Vocab Kit	MedStat	£13.95	B	Sec	l
Logifrench	Wida	£23	B,Econet	Sec	l
Morse Code	Aztec	£3	B,B+	J/S	l
Parlons Anglais	Private Tutor	£7.95	B,Electron	Sec	l
Quelle Tete	Cambridge Micro	£17.80	B,Econet	Sec	l
Repondez	Heinemann	£20.12	B	Sec	l
Russian Nouns	Wida	£23	B,Econet	Sec	l
Russkie Slova	Wida	£34.44	B,Econet	Sec	l
Russkiy Vybor	Wida	£34.44	B,Econet	Sec	l
Rusview	CALL	£10	B	Sec	l,aa
Saison de Achats	Wida	£20.13	B,Econet	Sec	l
Spanish Tutor	Kosmos	£7.35	B,B+,Electron	Sec	l
Spanish	Acornsoft	£11.05	B	Sec	l
Speaking French, German, Italian, Spanish	Private Tutor	£7.95	B,Econet	Sec	l
Tablero	Wida	£28.75	B,Econet	Sec	l
Tekstereatif	Wida	£28.75	B,Econet	Sec	l,jj
Telem-Nantes	Hodder	£19.55	B	Sec	l,dd
Tense French	Sulis	£9.95	B	Sec	l
Textbaumeister	Wida	£28.75	B	Sec	l
Textfill	Carsondale	£9.95	B	Sec	l
Umziehen	Cambridge Micro	£18.80	B,Econet	Sec	l
Unifill	CALL	£15	B	Sec	l
Unigap	CALL	£10	B	Sec	l
Unitext	CALL	£30	B	Sec	l
Uniview	CALL	£10	B	Sec	l,aa
Verbs	Sulis	£7.35	B	Sec	l
Vocab Tester	Beebugsoft	£10	B	Sec	l
Vocab – European Languages	Wida	£28.75	B,Econet	Sec	l
Wahlmeister	Wida	£28.75	B,Econet	Sec	l
Wordstore – European Languages	Wida	£28.75	B,Econet	Sec	l

MATHEMATICS

TITLE	PUBLISHER	PRICE	MACHINE	AGE	TYPE
A-Level Maths	SUMS	£15	B	Sec	m
Advanced Mathematics 1,2,3,4&5	Nelcal	£30.48	B,Econet	Sec	m
Algebra 'O' level	Ampalsoft	£5.13	B	Sec	m
Algebra Programs	Acornsoft	£9.95	A,B	Sec	m
All Aboard	Arnold Wheaton	£11.44	B	Sec	m
Alpha Graph	Arnold Wheaton	£9.95	B	J/S	m,u
Angle Tutor	Pee Bee	£9.95	A,B	J/S	m
Angle	Chalksoft	£14.25	A,B	J/S	m
Angle Turner	Arnold Wheaton	£9.95	B	J/S	m
Angles/Navigate	Primary Programs	£5.95	B	Ju	m
Angles Pupils Pack	S&S	£17.54	B	Ju	m
Angles Teacher Pack	S&S	£17.54	B	Teacher	m
Angles	Garland	£7	B,B+,Electron	Ju	m
Angles 1-3	Nelcal	£24.09	B	J/S	m
Approximation, Estimation, Std Form	Heinemann	£20.12	B	J/S	m
Area	Greenwood	£5	B	J/S	m
Astro Maths	Scisoft	£5	B	J/S	m
Basic Skills	Selective Software	£4	B	J/S	m
Bearings	Nelcal	£21.79	B	I/J	m
Beat the Clock	Arnold Wheaton	£9.95	B	I/J	m
BelPlot	BelTech	£9.50	B,B+,Electron	Sec	m
Bert Boot	Highlight	£6.95	B	Ju	m
Bestfit	Greenwood	£5	B	Sec	m,p
Binary Numbers	Chaddington	£10	B	Sec	m
Calfax – the Presfax Calculator	S&S	£19.49	B	Ju	m
Calculus "O"	Ampalsoft	£5.13	B	Sec	m,q
Cars – Maths in Motion	Cambs Software	£18	B	Ju	m,q
Cartesian	Flite	£24.90	B,Electron	Sec	m,u
Chords	Aztec	£6.50	B,B+	J/S	m
Co-ordinates	Garland	£7	B,B+,Electron	Ju	m
CoinA CoinB	Longman	£21	B	J/S	m
Coins	ESM	£9.43	B	Ju	m
Construction "O"	Ampalsoft	£5.13	B	Sec	m
Cranky	ASK	£9.95	B,Electron	Ju	m
Crossnumber	GSN	£12.08	B	Teacher	m,q
Decimals	S&S	£14.32	B	I/J	m
Decisions	ESM	£14.95	B	I/J	m
Dieccoin	Longman		B	J/S	m
Differences	ESM	£14.95	B	I/J	m
Dragon Mix	Taskmaster	£9.95	B	Ju	m
Early Learning	BBC	£10	A,B	Inf	a,c
Early Mathematics	Heinemann	£13.80	B	I/J	m
Early Years 1 & 2	Orion	£7.95	B	Inf	m,e
Easiplot	Synergy	£15.95	B,B+,Electron	Sec	m
Equations Suite	Garland		B	Ju	m
Estimation	Hodder	£27.60	B,Electron	I/J	m
Euclidean Geometry	Impact	£9.95	B	Sec	m
Evidence	Longman	£14.89	B	J/S	m
First Steps in Algebra	Small School		B	Sec	m
Fraction Suite	Wida	£23	B,Econet	I/J	m
Fun Academy	Shards	£14.95	B	J/S	m,v
Fun Maths	Cambridge Micro	£13.95	B	J/S	m

TITLE	PUBLISHER	PRICE	MACHINE	AGE	TYPE
Fundamental Algebra	Griffin	£11.95	B	Sec	m
Funplot	Ed Soft	£5.95	B	I/J	m
Geometrical Transformations	Edward Arnold	£26.50	B	Sec	m
Golfer	Strawberry Fair	£8.95	B	J/S	m
Graphical Representation	Drake	£8	B	Ju	m
Graphics Calculus	Glentop		B	Sec	m
Happy Times	ESM	£14.95	B	I/J	m
Hexallation	Cambridge Micro	£11.71	B	I/J	m
Highwire	Englefield	£6.25	B	Ju	m
Igraph	MEDUSA	£11.50	B	Sec	m
Infant Maths Series	MRH Systems	£24.95	B,Electron	Inf	m
Infant Maths Snap	Sherston	£10.35	B	Inf	m,n
Infant Suite	Primary Programs	£9.95	B	Inf	m,e
Introductory Algebra	Impact	£19.95	B	Sec	m
Introduction to Trigonometry	Griffin	£11.95	B	Sec	m
Investigator	Longman	£12.59	B,Econet	J/S	m
Jars	Acornsoft	£15.35	B	Sec	m
Jungle Maths	Scisoft	£5	A,B	I/J	m
Junior Maths	ESM	£15.95	B	Ju	m
Junior Maths	Micro Power	£6.95	B	Ju	m
Junior Maths	Aztec	£3	B,B+	Ju	m
Kestrel First Collection	BESS	£24	B	I/J	m
L	ATM	£10	B	J/S	m,q
Lasermaths	Logical	£7.50	B	Ju	m
Launching Logic	ESM	£14.95	B	I/J	m
Learn Addition, Multiplic-ation, Division, Subtration	ABC	£7.50	B	Inf	m
Learning mathematics	Heinemann	£13.80	B	J/S	m
Length	S&S	£14.32	B	J/S	m
Lessons in Maths with a Micro	ATM	£15	B	Sec	m
Little Red Riding Hood	Selective Software	£5	B	I/J	m
Logic Puzzles	Educational Software	£9.78	B	J/S	m
Match1/Match2	MUSE	£7	B	I/J	m
Mathematical Concepts	Drake	£8	B	I/J	m
Mathematical Investigations	Capital Media	£8	B	I/J	m,ll
Mathematics with a micro	Heinemann	£25.30	B	Sec	m
Mathemagic Land	LTS	£9.95	B	J/S	m
Mathematics 1&2	Acornsoft	£12.65	B,B+	cc	m
Mathematics Games and Activities	Capital Media	£8	B	I/J	m
Maths 1	Tutorial	£11.95	B,Electron	Sec	m
Maths Level 4	Ginn & Co	£16	B	J/S	m
Maths Revision	Abacus	£12.95	B	Sec	m
Maths Level 6	Ginn & Co	£16	B	J/S	m
Maths "O"	Ampalsoft	£11.05	B	Sec	m
Maths Master	GSN	£14.38	B	Ju	m
Maths with a Story	BBC	£10.95	B	J/S	m
Maths Level 7	Ginn & Co	£16	B	J/S	m
Maths Level 5	Ginn & Co	£16	B	J/S	m
Maths Snap	Sherston	£7.48	B	Ju	m,n
Maths Topics	Cambridge Micro	£15.95	B,Econet	Sec	m
Maths Translations	Corona	£5	B	Sec	m
Maths Talk	LTS	£9.95	B	Ju	m
Mathskills I & II	Griffin	£11.95	B	Sec	m
Mathsman	GED	£4	B	Ju	m
Matrices	Bryants		B	Sec	m
Matrices	Chaddington	£10	B	Sec	m
Measurement	Britannica	£75	B	Inf	m,ee
Merlin Teaches Tables Pack	Hodder	£17.25	B	I/J	m
Meteor Multiplication	Taskmaster	£9.95	B	Ju	m
Metrics Quiz Plus	Chalksoft	£14.25	B	J/S	m
Micro Maths Suite	LCL		A,B	Sec	m
Microsmile 1 & 2	Centre for Learning Resources	£15	B	I/J	m
Middle School Maths	Scisoft	£6.95	B	I/J	m
Minus Mission	Taskmaster	£9.95	B	I/J	m
Missing Signs	Acornsoft	£15.35	B	J/S	m
Mland	Greenwood	£5	B	J/S	m
Mmaths	Ed Soft	£4.95	A,B,B+,Electron	Ju	m
Money Plus	Fernleaf	£31.26	B	J/S	m
Monster Maths	Shards	£6.95	B	I/J	m
Motion Geometry	Garland	£7	B,B+,Electron	Ju	a
Music Maestro 1-4	Mupados	£15.49	B	J/S	m
Nightmare Maths	Logical	£7.50	B	Ju	m
Number and Money	ESM	£8.20	B	I/J	m
Numerical Methods 2	ISMeC		B	Sec	m
Number Five	Chalksoft	£14.25	B	Ju	m
Numeracy 1,2,3,4,5	ESM (Shiva)	£55	B	Ju	m,n
O-level Maths	Scisoft	£7.95	B	Sec	m
Ordering	ESM	£14.95	B	I/J	m
Pascal	Chalksoft	£6.95	B	J/S	m
Passit Transgeometry	Ed Soft	£5.95	B,B+	Sec	m
PEAC 2	RESOURCE	£10.95	B	I/J	m
Pictorial Representation	ABC	£8.50	B	I/J	m
Picture Maths	AJ	£9.95	B	I/J	m
Pirates	Longman	£20.13	B,Econet	J/S	m
Placeval	Ed Soft	£4.95	A,B,B+	Ju	m
Playing with Places	ESM	£14.95	B	I/J	m
Plotter	Selective	£5.50	B	J/S	m,u
Plotting Graphs	Heinemann	£18.40	B	Sec	m,u
Polygon Tutor	Pee Bee	£7.50	A,B	Sec	m
Probability	Selective	£5	B	Sec	m
Programs for Mathematical Computing	MEI	£17.50	B,B+ Elk,Econet	Sec	m
Pythagoras' Theorem	Griffin	£11.95	B	Sec	m
Quadratic Equations	Longman	£18.34	B	Sec	m
Quadratic Functions "O"	Chaddington	£10	B	Sec	m
Ratio	Garland	£7	B,B+,Electron	Ju	m
Scalde	MUSE	£6.50	B,B+	Sec	m
Scales	Heinemann	£20.12	B	Sec	m

TITLE	PUBLISHER	PRICE	MACHINE	COMMENT	KEY
Scales	Strawberry Fair	£8.95	B	J/S	m
Scottish Primary Maths Group	Heinemann	£56.93	B	J/S	m
Secondary Mathematics	Heinemann	£13.80	B	Sec	m
Sets and Operators	ESM	£14.95	B	I/J	m
Shape Up	ASK	£9.95	B,Electron	Ju	m
Shape and Race	H&H	£5.50	B	I/J	m
Shares for All	ESM	£14.95	B	I/J	m
Shoot	Soft Centre	£6.90	B	Ju	m
Signals and Magic	H&H	£5.50	B	J/S	m
Simple Equations	Drake	£8	B	I/J	m
Sorting	Drake	£8	B	Inf	m
Slimwam 1&2	ATM	£17	B	I/J/Sec	m,ll
Special Poducts	Impact	£14.95	B	Sec	m
Spider	Cambridge Micro	£11.71	B	I/J	m
SPMG Metric Units of Weight	Heinemann	£12.50	B	J/S	m
Squeeze	ASK	£9.95	B,Electron	I/J	m
Submarines	GED	£4	A	Ju	m
Sum Up	Learnwell	£4	B,Electron	Ju	a
Supergraph	Glentop		B	Sec	m,gg
Symbols	Britannica	£75	B	Inf	m,ee
Symmetry	Acornsoft	£14.95	B	Sec	m
Table Test 1-4	Drake	£8	B	Ju	m
Tables Adventure	ASK	£9.95	B,Electron	I/J	m
Tables	AVC	£3	B	Ju	m
Tables Teacher	Dr Soft	£6.95	B	Ju	m
Tables	Bryants	£5.10	B,B+	Ju	m
Tablesums	Griffin	£9.95	B	Ju	m
Tasmath	Tasman	£5.95	B	Sec	m
Teacher in the Custard	Pee Bee	£8.50	A,B	I/J	m
Tecdv	Longman	£20.13	B	Sec	m
Tess	H&H	£7.50	B	J/S	m
Tessellations	Cambridge Micro	£23.43	B,Econet	J/S	m
Tesselator	Addison Wesley	£21.95	B	J/S	m
The Cross number puzzle	Darwood	£4.65	A,B	I/J	m
Tick-tock	Nisbet	£8.05	B	I/J	m
Time	S&S	£17.54	B	Ju	m
Times Tables	Aztec	£3	B,B+	I/J	m
Timetable/Clock	Primary programs	£5.95	B	J/S	m
Transformations, Calculus, Trigonometry and Sketching	Educational Software	£23	B	Sec	m
Travel	S&S	£16.04	B	J/S	m
Treasure Hunt	Kingfisher	£7.50	B,B+	Ju	m
Tree of Shapes	Bryants	£5.10	B,B+	J/S	m,dd
Triangles	Chalksoft	£9.25	B	J/S	m
Triangle Tutor	Pee Bee	£6.50	A,B	J/S	m
Triangles/Regular Shapes	Primary Progress	£5.95	B	J/S	m
Trigonometry "O"	Ampalsoft	£5.13	B	Sec	m
Trigonometry Basics	Impact	£14.95	B	Sec	m
Tryangles	Earth Science	£14.95	B	Sec	m
Tstar	MUSE	£7	B,B+	Ju	m
Vectors	Cambridge Micro	£15	B	Sec	m
Vedic Multiplication	Wida	£23	B,Econet	J/S	m
Venn	MUSE	£6	B	Sec	m
Venn Diagrams	GSN	£14.38	B	J/S	m
Vortex	Cambridge Micro	£11.71	B	I/J	m
Wizard's Revenge	Sherston	£14.38	B	Ju	m

PHYSICS

TITLE	PUBLISHER	PRICE	MACHINE	COMMENT	KEY
16+ Physics	Herdman	£12.95	B	Sec	p
A to D	MegaCyCAL	£12	B	Sec	p
Acoustics	Longman	£20.13	B,Econet	Sec	p
Advanced Organic Chemistry	Herdman	£12.95	B	Sec	p,c
Ampli	SciCAL	£11.75	B	Sec	p
Ampli	MegaCyCAL	£12	B,Electron	Sec	p
Astruct	MUSE	£7	B,B+	Sec	p
Atoms	Weaversoft	£7.95	B	Sec	p
Barrage	Micro Power	£7.95	B	Sec	p,s
Bell	MUSE	£5.50	B,B+	J/S	p
Capacitor	Longman	£20.13	B,Econet	Sec	p,s
Circuit Designer	Paean Systems	£24.95	B	Sec	p
Collisions	Longman	£20.13	B,Econet	Sec	p,s
Confunc	MegaCyCAL	£12	B	Sec	p
Counter Currents	Longman	£20.13	B,Econet	Sec	p
Current Balance	GSN	£14	B	Sec	p
D to A	MegaCyCAL	£12	B	Sec	p
D.C.	MegaCyCAL	£9.95	B,Electron	Sec	p
D-Logic	MegaCyCAL	£12	B	Sec	p,s
Decay	GSN	£17.25	B	Sec	p
Demonstration Programs	Longman	£20.13	B,Econet	Sec	p
Density	Acornsoft	£11.90	B	Ju	p
Determination of Electrostatic Constant	GSN	£17.25	B	Sec	p
Digital Electronics	Garland	£16.68	B	Sec	p,i
Dynamic Modelling System	Longman	£40.25	B	Sec	p
Dynamo	Notts Council	£9.95	B	J/S	p
Einstein's Quanta Simulation	GSN	£17.25	B	Sec	p
Electonics in Action	BBC	£17.20	B	Sec	p
Electrostatics	Garland	£11.75	B,B+,Electron	Sec	p
Electromagnetic Spectrum	BBC	£17.20	B	Sec	p
Electrons	MUSE	£6.50	B,B+	Sec	p,s
Electrical Equipment Data	AUCBE	£11.50	B,Econet	Sec	p
Electricity Impedance	Longman	£20.13	B,Econet	Sec	p
Electricity "A"	Longman	£23	B,Econet	Sec	p
Electricity	Primary Progress	£5.95	B	J/S	p
Field Line Simulation	Garland	£10	B,B+,Electron	Sec	p
Floater	Cambridge Micro	£18.41	B,Econet	Sec	p
Floating and Sinking	Longman	£18.34	B,Econet	Sec	p
Fluid Mechanics	Pitmansoft	£22.94	B	Sec	p
Frequency Response	MegaCyCAL	£12	B,Electron	Sec	p

TITLE	PUBLISHER	PRICE	MACHINE	COMMENT	KEY
Friction	Wiley	£34.95	B	Sec	p
Gaseous Diffusion	Longman	£20.13	B,Econet	Sec	p
General Physics "A"	Longman	£34.50	B,Econet	Sec	p
Gravity	Longman	£20.13	B,Econet	Sec	p
Heating a Wire	Longman	£17.83	B	J/S	p
Howe can faulty electrical components be identified?	Modular	£37.50	B	Sec	p
How can nuclear instability provide source of energy?	Modular	£37.50	B	Sec	p
Hydraulics	Database	£5.50	B	Sec	p
Images	MagaCyCAL	£9.95	B,Electron	Sec	p
Interference and Diffraction of Waves	Edward Arnold	£16	B	Sec	p
Investigating Circuits	Longman	£20.13	B	Sec	p
Isaac	Earth Science	£14.95	B	Sec	p
Lenses	Heinemann	£20.12	B	Sec	p
Linear Motion	Wiley	£34.95	B	Sec	p
Longitudional Waves	Heinemann	£14.38	B	Sec	p
Magnets	Macmillan	£6.95	B	J/S	p
Mass Spectrometer	Longman	£20.13	B,Econet	Sec	p,s
Middle Secondary Physics Pack	Longman	£34.50	B,Econet	Sec	p
Millikan's Oil Drop Experiment	GSN	£17.25	B	Sec	p
Models in Physics	Garland	£11.75	B	Sec	p
Molecular Behaviour	Ardsoft	£6	B	Sec	p
Momentum	Longman	£20.13	B,Econet	Sec	p,s
Momentum and Impacts	Wiley	£34.95	B	Sec	p
Motion	MegaCyCAL	£9.95	B,Electron	Sec	p
Multiple Slit Interference	GSN	£17.25	B	Sec	p
Newton	Edward Arnold	£15	B	Sec	p
Newton and the Shuttle	BBC	£23	B	Sec	p
Nuclear Reactor Simulation	Longman	£16.68	B,Econet	Sec	p
Nuffield Physics Pack	Longman	£34.50	B	Sec	p
O/A Level Physics Definitions	Akadamias	£9.95	B,Econet	Sec	p
Operational Amplifiers	MegaCyCAL	£12	B,Electron	Sec	p
Optics	MUSE	£6.50	B,B+	Sec	p
Optics	Hutchinson	£19.16	B	Sec	p
Oscilloscope	Garland	£15	B,B+,Electron	Sec	p
Particle Scattering	Edward Arnold	£13.04	B	Sec	p
Pendulum	MUSE	£7	B,B+	Sec	p
Photo-electric Effect	Longman	£20.13	B,Econet	Sec	p,s
Physics	Micro Power	£6.95	B	Sec	p
Physics Disc 3	Garland	£18.18	B	Sec	p
Physics Revision	Abacus	£12.95	B	Sec	p
Physics Disc	Garland	£31.75	B	Sec	p
Physics Suite 2	Griffin	£12.95	B	Sec	p
Physics	Garland	£36.51	B,B+,Electron	Sec	p
Physics	Longman	£14.50	B	Sec	p
Physics	Tutorial	£11.95	B,Electron	Sec	p
Physics Suite	GSN	£11.50	B	Sec	p
Physics Experiments	MEDUSA	£10	B	Sec	p
Physprob	AVC	£3	A,B	Sec	p,q
Primary School Science Project	Glentop		B	Ju	p,b
Projectile Motion	Wiley	£34.95	B	Sec	p
Projectiles	Garland	£10	B,B+,Electron	Sec	p,s
Qbank Physics	In-sight	£30	B	Sec	p,hh
Radioactive Decay	Longman	£20.13	B,Econet	Sec	p
Rayleigh	GSN	£14	B	Sec	p
Reaction Kinetics	Edward Arnold	£16	B	Sec	p
Reilly	Earth Science	£12.95	B	Sec	p
Resistor	RJE	£4.95	B	Sec	p
Revise Physics	MegaCyCAL	£8.50	B,Electron	Sec	p
Ripple Tank/Wavenotes	MUSE	£9.50	B	Sec	p
Space Track	Cambridge Micro	£11.71	B	J/S	p,c
Speed and Light	Acornsoft	£11.90	B	JU	p
Switches and Diodes	Garland	£11.75	B,B+,Electron	Sec	p,s
Temperature Control	Acornsoft	£9.95	B	Sec	p,s
Thermal Equilibrium	Garland	£11	B,B+,Electron	Sec	p
Transverse Waves	Heinemann	£20.12	B	Sec	p
Uniformly Accelerated Motion	BBC	£19.95	B	Sec	p
Velocity of Light	GSN	£17.25	B	Sec	p
Watts	Cambridge Micro	£15.95	B,Econet	Sec	p
Waveform Analysis	Garland	£11.26	B,B+,Electron	Sec	p
Waves	BBC	£17.20	B	Sec	p,s
Waves	MegaCyCAL	£9.95	B,Electron	Sec	p
Waves and Vibrations	Griffin	£9.95	B	Sec	p
Why do we say thanks to Newton?	Modular	£37.50	B	Sec	p
X-ray Crystallography	GSN	£14	B	Sec	p
Young's Slits	Heinemann	£23	B	Sec	p

ASTRONOMY

TITLE	PUBLISHER	PRICE	MACHINE	COMMENT	KEY
Astronomy	BBC	£9.20	B,Electron	Sec	z
Constellation	Micro Power	£6.95	B	Sec	z
Night Sky	Bridge	£9.90	B,B+	Sec	z
pH/Titrations	IRL	£22.50	B,B+	Sec	z
Planet Patrol	Macmillan	£6.95	B	J/S	z,q
Planetary Motion	Longman	£20.13	B	Sec	z
Satellite Orbits	Edward Arnold	£16	B	Sec	z
Space Scan	Macmillan	£10.50	B	I/J	z
Starfinder	Century	£12.95	B	J/S	z
Starmap	Heinemann	£18.40	B	Ju	z
Stars	AUCBE	£13.80	B,Econet	Sec	z
Starseeker	Mirrorsoft	£9.95	B,Electron	Sec	z
Sulphuric Acid	Longman	£14.50	B,Econet	Sec	z
Symbols to moles	Heinemann	£20.12	B	Sec	z
Titration	Garland	£11	B,B+,Electron	Sec	z

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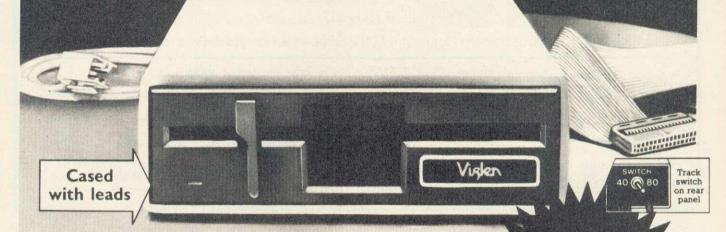
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ACORN USER MAY 1986

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	6502
	32016
	68000

BUSINESS

Beeb's Swift spreadsheet

Audiogenic Software has converted its *Swift Spreadsheet* package to run on the Beeb. The software sells at £29.95 and comes on an EPROM.

It uses pop-up menus to allow easy access to the spreadsheet's commands and offers a sheet area of 3200 cells.

Other features include flexible cell formatting and a bar graph display option.

Contact Audiogenic Software on (0734) 303663.

Manager for 128

Contex Computing has released a version of its *Bank Manager* financial management package for the BBC 128.

It eliminates the disc overlaying necessary with the model B version by storing all the program in the 128's sideways RAM.

The price is £21.50, or £5 to users who return the old version to Contex Computing. Tel: (02303) 347.

Beebs go to press

by Geoff Nairn

Top British newspapers are looking at using BBC micros to replace their trusty – but rusty – Remington typewriters.

Over 90 representatives from provincial and national newspapers, including the *Daily Express* and the *Financial Times*, were due to attend a meeting of the Web Offset Newspaper Association (WONA) in Maidstone on March 18, where a BBC micro was being used to help produce a newspaper.

Mike Barnes, a typesetting consultant, was to show off his £1600 system, which consists of a modified Beeb and some typesetting software, hooked up to a phototypesetter.

This allows stories entered at the keyboard to be quickly turned into a forme – a photographic negative – ready for the printing presses and is cheaper than both the traditional hot metal process

Today: gone for the new technology

and dedicated computer terminals, said Mike Barnes.

A special newspaper was produced using his software at the Newstec exhibition last year (see page 9, *Acorn User* February '86) by journalists from the *Kent Messenger*. The *Kent Messenger* is hosting the WONA conference and has a BBC micro of its own

'knocking around somewhere', according to a spokesman.

Many provincial and national newspapers, including *The Times* and *Today*, have already plumped for new technology, but the idea of using cheap microcomputers is new and, according to Alan Shanks, secretary of WONA, it could revolutionise the industry.

He said: 'Dedicated systems, which cost £24,000, can be replaced by £5000 computers or wordprocessors.

'Newspapers will be able to set up anywhere with just a wordprocessor and a local instant print shop.'

Eddie Shah, proprietor of *Today* and a member of WONA, recently invested heavily in dedicated – and expensive – computer production equipment.

Pinched

But already the writing is on the wall, for BBC micros are used by two *Today* contributors to send in copy over the phone lines. Apple and Tandy micros are also used at *Today*.

Chris Curry, co-founder of Acorn Computers, has pinched 12 former employees who helped build the Acorn Communicator – including the two bosses – and has set up a new company, General Information Systems (GIS), at Croxton Hall, his Cambridgeshire country manor.

He is understood to be developing the Communicator for use as just such a newspaper production tool, though Ramanuj Banerjee, former technical manager of the Communicator project at Acorn, would not comment on the proposed activities of GIS.

Scottish bank breaks into market

The Bank of Scotland is looking to break into the English market using its electronic banking service, HOBS, as a spearhead.

The service, launched last year, was originally aimed at micro-owning private customers but was revamped for businesses.

It allows them, by using a micro or Prestel terminal, to pay suppliers, transfer money from current accounts to interest-bearing investment accounts, obtain statements and, by showing cleared balances, project their cash positions.

A Bank of Scotland spokesman

told *AU*: 'The level of interest in the service has been very encouraging, certainly in the thousands, but it's too early to say how many people will actually sign on the dotted line.'

Foothold

HOBS allows the Bank to gain a foothold in the booming English retail banking sector, and is certainly cheaper than the more conventional way – buying High Street sites.

The Bank said: 'There are too many players in the Scottish banking market, so we decided to

expand South of the border, where the Big Four (main UK clearing banks) have had the market to themselves for too long.'

HOBS – Home and Office Banking Service – is available to domestic customers for £5 per month – plus Prestel and telephone charges. The full money management service for businesses costs £20 per month. A Prestel adaptor is available for £90, but most of the customers using HOBS to date had their own.

A similar service, run by the Midland Bank, has been particularly popular with Beeb owners.

Video from Ivan Berg

One-to-One starts battling

The battle for electronic mail customers hots up as One-to-One cuts its charges and expands its services.

One-to-One is one of the four main e-mail suppliers fighting it out in the UK – each with incompatible services. The others are Comet, Easylink and market leader Telecom Gold.

One-to-One has dropped individual message charges – previously 5p or more – for its 6000 subscribers and has added a viewdata port, allowing those with Prestel terminals to use the service. There is still a time charge of 10p per minute and a £50 one-off charge for each mailbox.

It has also added a noticeboard, 121World, where 'for sale' notices and general business information can be posted free of charge.

The changes are an attempt to reach large corporate users, where One-to-One has been under-represented; most of its customers are small businesses, using the service to provide low-cost access to the much larger Telex network.

Rivals

British Telecom was unimpressed with its rival's moves and its Telecom Gold tarifs stay the same – higher than One-to-One's. Instead BT hoped that its recent commitment to the X400 technical standard for e-mail would get customers signing up.

Telecom Gold MD, Peter Burry, said: 'X400 is the most significant development in electronic mail and we will see the first practical implementations of the standard later this year.'

Telecom Gold tarifs are: up to 11p per minute useage charge, 20p per month storage charge for the equivalent of a side of A4, and a £300 subscription for corporate customers, allowing unlimited mailboxes. 'Club users' pay only £40 per mailbox.

by Geoff Nairn

Ivan Berg Software is the latest contender in the interactive video market with a tape-based BBC micro system, the Take Five.

Aimed squarely at industrial training applications, the Take Five allows material recorded on standard Betamax format video tape to be turned into an interactive training course with question-and-answer frames supplied by the BBC micro.

The Take Five systems costs £2933 which includes a modified Beeb with dual disc drives, a Sony colour monitor and a Sony Betamax recorder – though U-Matic is available as an option.

Acorn spurned video tape and went for a Philips videodisc-based system for its attempt to conquer this burgeoning market. Such systems require purpose-made video discs and cannot record.

The Acorn system, called Master Video, now features a Master 128 and a Philips or Pioneer laser disc player, and sells for £3220. There is also a more compact version for £3750.

Acorn Video, a subsidiary of Acorn Computers, claims to have sold 30-40 video systems, mainly for commercial training and point-of-sale applications.

However, to date, few large customers have placed repeat or-

Take Five: the latest contender in the interactive video market

ders after buying an initial trial machine from Acorn, and Lloyds Bank, looking to buy 1500 machines for staff training, rejected their two Acorn machines and chose a dedicated system from Video Logic.

Complaint

One complaint has been that the picture on the Acorn system is unsteady – a complaint traditionally levelled at tape-based systems. Chris Turner of Acorn Video blamed the technical problem and the loss of the Lloyds Bank contract on the turmoil Acorn went through at the beginning in 1985.

He said: 'We just couldn't offer the support or commitment. Now we have every chance of winning such a contract on technical and

commercial grounds.'

Acorn was to supply the hardware and software for the BBC-produced video discs in the BBC's ambitious Domesday Project. However, because of Acorn's plight last year, the BBC took over writing the retrieval software, which is stored on the videodisc.

The project has slipped behind schedule but hardware, software and videodisc should be ready for November.

Chris Turner said the company was looking at the possibility of making an IBM PC-based interactive video system, as many of its largest potential customers had a 'buy IBM' policy.

But the Acorn-based machine would not be dropped, he added.

BUSINESS TOP FIVE

	Title	Publisher	Cassette	Disc	ROM	Electron	Shadow on B +	6502	Econet
1	Mini Office	Database	£5.95	£7.95 £9.95†	—	£5.95	*	*	—
2	Mini Office 2	Database	£14.95	—	—	Yes	*	*	—
3	Beyond Basic	BBCSoft	£11.50	—	—	—	Yes	—	—
4	Wordwise	Computer Concepts	—	—	£56.35	—	—	—	—
5	Wordwise +	Computer Concepts	—	—	£56.35	—	—	Yes	—

Compiled by Gallup/MicroScope. * Contact publisher: Database Publications, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY. BBCSoft, 35 Marylebone High Street, London W1M 4AA. Tel: 01-580 4468. Computer Concepts, Gaddesden Place, Hemel Hempstead, Herts HP2 6EX. Tel: (0442) 63933. † 3″ disc

BUSINESS PROCESSING FROM THE WORD GO

In this first of an occasional series of articles on wordprocessors and wordprocessing, advice for disc users is offered

Jacquetta Megarry

Most people who use their Beeb for wordprocessing soon find they need a disc drive. For this wordprocessor article, therefore, I'm starting with advice for disc users that applies whether you favour *View*, *Wordwise*, *Wordwise Plus*, *Scribe* or another system.

You'll quickly find that you fill discs faster than you thought possible! Decide your policy on disc management on the following: how often to save and how many backup copies to keep; how often to weed out and tidy up your discs; how to arrange documents on discs and how to keep track; whether and how to use directories (see below); and how to give your files short but meaningful names.

Sooner or later you'll find that a file (or even a whole disc) has been corrupted. How you feel about this will depend on whether it was a long-dead letter or the priceless text of your first novel of which you have no hard copy. If you're sensible about handling discs, you may have no problems for months or years, but Murphy's Law suggests that if you do have a disaster, it will inevitably be to something that cost you blood and sweat to write.

Basic precautions

The most basic precaution is to save anything important twice onto two separate discs: if one gets destroyed you have a good chance that the backup disc hasn't. If you compose at the keyboard you'll have no other copy of your text, so it's also a good idea to print at least a rough copy before switching off. You should save before you print, as text can be lost at the touch of Break while printing.

Don't wait till you've finished a document to save it: a power cut can wipe everything out. Depending on your habits and system, you may find frequent saves distracting. Personally I save every hour or so and every time I have to break off for a cup of tea.

Don't fall in the trap of storing intermediate versions of the same document. It just uses up disc space and if you're not careful you can waste ages trying to work out which is the current version. Unless you'll *need* a previous version again, overwrite the old with the new by saving it with the same filename. In *Wordwise* and *View* you get no warning that you're about to wipe out the old file: if this causes you problems, lock valuable files using *ACCESS file name L. *Wordwise Plus* checks first with 'Replace old file?'.

It's sensible to weed out unwanted files as soon as you can, as you'll forget what document the filename stands for, and have to load the text back in before deciding to delete it – fairly quick with *View* and *Wordwise Plus*, but slow with *Wordwise*. Use *DELETE followed by the filename unless you're confident of the more drastic ways of deleting files. After a deleting session is the ideal time to tidy up the disc using *COMPACT. Make sure you've saved any text in memory first, though, as *COMPACT will clear it!

You may compose a variety of document types: letters, memos, minutes, address labels, reports, articles, even booklets or books. Perhaps you also store programs written in languages such as Basic, Logo or *WordPlus*. Try to avoid mixing different types of document, or documents with programs, on a disc.

Label each disc clearly with the document type, and resist the temptation to use it for anything else. Record the category name (up to 12 characters) on the disc using *TITLE. For example *TITLE mail_labels1 might title your first address labels disc. Keep a written record of the disc catalogue with the disc. Most systems let you print one in Command or Menu Mode by enabling the printer (which must already be switched on and on-line) with CTRL-B, then *CAT (or *.) and finally CTRL-C to disable the printer.

If you keep different file types on different discs, you may not need to bother about directories. But not everyone finds this easy, and directories are important to enjoy fully the benefits of the Advanced Disc Filing System (as supplied in the master).

A directory is a way of labelling files on a disc so that those which belong together appear together in the catalogue and are easy to copy and delete as a group. Each directory is like a ring-binder labelled with a single character: almost any keyboard character will do, but most people use letters. If you only had one disc for all your files, therefore, you could use the B directory for Basic programs, the L directory for letters, M for memos, R for reports and so on.

To change from the current directory (which is $ by default) to directory R, simply type *DIR R. To return to $, type * DIR $. You can save a file called report1 to the R directory while still in $ by typing its filename preceded by R. – R.report1.

Clever filenames

Devising a helpful filename within seven characters can be quite a challenge. Clever coding systems can be difficult to crack weeks later, and shortened filenames can be hard to type and remember: 'consons' is a better abbreviation for 'consonants' than 'cnsnnts'. Never include spaces, but you can use hyphens and most punctuation marks if you want (but avoid full stops on networks).

It's worth including the filename as part of a draft document. *Wordwise Plus* users can do this automatically with the embedded command <f1>ps F$<f2>. You can always delete the filename before your final printout.
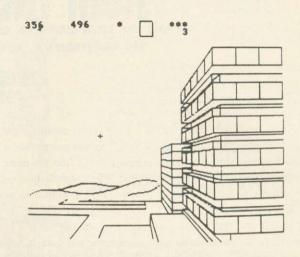
If you want to include the date in a filename, give the month before day so that the files will catalogue in sequence. If you need to include the year, code it (6 for 1986, 7 for 1987) before the month. Thus on May 8 I might save a letter as jm60508 while tomorrow I might use jm60509, and so on. Avoid using numbers at the beginning of a filename, especially in *Wordwise*, as it's easy to mix them up with the menu numbers.

If you've got a Master 128, you've already got *View* built-in, and documentation of a kind is given in the Welcome Manual. One of many things it doesn't tell you is how to access the real-time clock/calendar (CTRL-T for time, CTRL-D for date) within *View*.

And if you still prefer *Wordwise* to *View*, you need *Wordwise Plus* version 1.4D or later, distributed as standard since around January 1986 (contact Computer Concepts if you need to exchange versions). Since *WORD selects *View*, you'll need to type *WORD. (or *WORDWISE) to get *Wordwise Plus*. Wouldn't it be lovely if Computer Concepts seized the chance to do a cheap disc version of *Wordwise* to run in sideways RAM?

ACORN FORUM

In this forum for owners of Acorn micros, Mike Barwise concludes his series on discs and a daisywheel screen dump is presented

KEEPING TRACK OF THE DISCS

From the point of view of performance, the most interesting feature of the IBM format for discs is the sector numbering (see last month's Acorn Forum). Sectors are usually numbered consecutively within a track, and in the Acorn system they are numbered zero through nine.

However, it isn't obligatory to start each track with sector zero; in fact, just numbering the sectors of each track zero through nine starting at the index hole each time would lead to a very inefficient system.

This is because of the relationship between the drive head stepping time and the time taken for a sector to pass under the drive head. Assuming the sectors are evenly disposed throughout the track (they are not, but the discrepancy is very small in Acorn format), each sector takes one tenth of a revolution at 300rpm or 20 milliseconds to pass under the drive head. The head step time varies from drive to drive between three and 30 milliseconds, and there is an additional settling time of between 12 and 45 milliseconds to allow for vibration due to the inertia and elasticity of the head stepper mechanism to die away.

Painfully slow

Assuming a mean case of a 12ms step and 12ms settling time (24ms total), we read our first track. Having read sector nine, we step the head to the next track. Sector zero must be read first, but we have taken 24ms to get to the track. As sector zero started effectively on the same radius as sector nine finished, we now find that sector zero has gone past, and so has part of sector one. The remaining four-fifths of a revolution must now take place before sector zero comes under the drive head again, so the real time between reading tracks is about a fifth of a second (200ms) instead of 24ms.

If we are clever during formatting, though, and start numbering our sectors on the second track from number eight at the index hole, through nine, zero, and so on, the correct sector will be just about to pass under the drive head as the step and settling time end. This is the concept of 'sector stagger'. Every track from one onwards starts at its index hole with a sector number which is n less than the previous track start sector.

Ideally, stagger should be fine-tuned to an individual drive step rate and settling time. However, this would oblige the user to stick with a given drive system and with discs formatted on that system, or pay a heavy penalty in loss of efficiency. Acorn has again come up with an excellent compromise. The Acorn stagger of minus four (stagger should always be expressed as minus something) allows step-plus-settling totals of up to about 75ms to be accommodated. This covers most low-cost new systems and practically all old full-height drives. With really classy units like half-height Teacs, it's possible to reduce the stagger to minus three or even minus two, provided the step rate of the floppy disc controller chip (FDC) can be set to match the optimum drive step rate. The performance increase is quite dramatic, with a trade-off of limited interchangeability. If in doubt, too much stagger is better than too little.

Of course, there is no way of tuning the stagger so that the first sector matches the first track of your file after the primary seek form the disc catalogue. The best you can do is set up your system to match the drive step rate as nearly as you can so this seek is as fast as possible. BBC micro users should set the links or DIP switches along-side the keyboard to suit the slowest drive in the system. Atom users with Disc Packs really have no control, as the step rate and settling time are coded as literals in the DOS. Bear AFDC users can set up the step rate for each drive individually, but the settling time is fixed at 30ms.

Now that the basics of the ID structure have been explained, we move on to how you can play with discs at the sector level.

All IBM-standard FDCs have certain things in common. They all expect you to provide them with a track number, a sector number, and an opcode telling them whether to read or write. The architecture of different chips varies, so the syntax will vary too, but fortunately we have to deal with just two alternatives: the Intel 8271 and the Western Digital family. Various independent FDCs for the BBC micro have used different members of the WD family, but their command structure and codes are practically consistent, so these notes apply to the 179x series, the 279x series and the 1770.

The Intel 8271 has a command/status register, a general parameter/result register and a data register. Commands are sent by writing the opcode to the command register while the FDC is not busy, followed by a variable set of parameters to the parameter register. There is a fairly involved initialisation sequence to be performed on start-up or after reset, as all the drive parameters and some parameters not used on Acorn systems must be loaded into the FDC by a 'specify' command. This makes working outside a DFS rather cumbersome. Parameters for data-processing commands always include the track and sector number so that a single opcode performs the seek and the read or write operation. Any errors are reported in the result register. The data transfers are performed through the data registers (read or write) – on Acorn systems, the data transfers are synchronised by use of the NMI interrupt.

Features unique to the 8271 include a 'fixed-length key scan data' operation and a 'read IDs from track' operation.

The Western Digital FDCs have a much simpler architecture and command structure. There are four read/write registers: command/status, track, sector and data.

Information on errors

The standard syntax is: load track register, send seek opcode, wait for completion, load sector register, send read or write opcode. Data are then presented through the data register in the relevant direction, and on termination the status register provides information on any errors. The WD series allow the user to read the first encountered ID after the index hole on any track, and also to dump an entire track to memory including all gaps, ID headers and CRCs. This allows corrupt discs to be recovered if you know how. Remember that you will need about 3200 bytes in single density and abut twice this in double density in which to store the data.

Details of all these commands can be found in the manufacturers' data sheets, which should be studied carefully. If you don't understand what you're doing, you can do a lot of damage to your data by thumping around at sector level because there's no error protection. However, once you have taken the plunge, data can be stored on discs without catalogues by the simple method of saving it up in a 256 byte buffer and sending it to specified sectors. The Acorn 10-sector track lends itself to working in decimal numbers, as the track and sector can be calculated directly

from the absolute sector number by decimal division in Basic. An NMI service data transfer routine will be needed, but all other operations could be performed (rather slowly!) from Basic by using the ? operator. There are many applications for this kind of disc storage, mainly in the field of true random access.

Finally: the only thing you can spoil by poking around the FDC is disc data. You can't really damage your micro or your disc drives by mistakes at machine level, but you mustn't try to seek past the number of real tracks on your drive.

All drives have a springy end stop to allow for the occasional over-seek, but bashing on it will mis-align the drive head. The rule is: if it rattles, hit Break.

DUMPS ON A DAISYWHEEL

The problem with daisywheel printers is that you can't print graphics. Until now, that is! With the help of this little program (listing 1) from Dave Atherton, your daisywheel printer can produce quite acceptable screen dumps. Daisywheel printers don't have definable graphics so the full stop character is used to produce the dump.

The program works by scanning the screen (or a section of it) using the POINT command and printing a full stop every time a dot is detected. To start with, a screen image is loaded from disc (line 80), although you could create something on screen with some lines of code instead.

The area of the screen to be dumped is set in

```
 10 REM Daisywheel Screen Dump
 20 REM for Brother HR15, Juki etc.
 30 REM by Dave Atherton
 40 REM for BBC/B+/M128/Electron
 50 REM (c) Acorn User
 60 :
 70 MODE4
 80 *LOAD Screen FFFF5800
 90 :
100 size=1
110 x1=0:y1=0
120 x2=1279:y2=1023
130 margin=20
140 :
150 PROCsetprinter
160 VDU 2
170 FOR Y%=y2 TO y1 STEP -4
180 VDU 1,13
190 FORI%=1 TO margin:VDU1,32:NEXT
200 FOR X%=x1 TO x2 STEP 4
210 dot=POINT(X%,Y%)
220 VDU 1
230 IF dot=1 THEN VDU 46 ELSE VDU 32
240 NEXT X%
250 NEXT Y%
260 VDU3
270 PRINT TAB(0,30)"Dump done":END
280 :
290 DEFPROCsetprinter
300 VDU 2,1,27,1,&1F,1,4*size
310 VDU 1,27,1,&1E,1,2*size,3
320 ENDPROC
```

Listing 1. Daisywheel screen dump

A daisywheel screendump!

lines 110-120 and line 130 sets the margin on the paper (in dots, not character spaces). PROCsetprinter programs the printer to do very narrow character spaces, and very short line feeds. These codes are for the Brother/Juki range of printers, but other daisywheels should have similar codes. The setting shown is 1/60″ character space and 1/48″ line feed.

Lines 170 to 250 perform the scan. In the listing, which is designed to run in mode 4, all colours except the background will appear as black. By altering line 230 to, say:

IF P%=2 OR P%=4 ....

selected colours can be dumped. It's also perfectly possible to run the program in other screen modes.

When using the program, it's good to put a couple of pieces of paper behind the one you are printing on, as the hammering effect of the full stop can easily wear its way through to the printer platen. Also you will probably find that carbon ribbons tend to give a slightly better image, as indeed they do in text printing.

You may find that the image produced is a negative of that required. If this is the case, change the value of 'dot' in line 230 to 0.

NEW VIEWS ON LIFE

The *View* function keys can be set up to hold whatever strings and commands you wish. To do this enter command mode and type:
*FX228,1
Function keys can then be defined as usual:
*KEY 0 "Acorn User"
Acorn User can then be inserted into your text anywhere you want, just by pressing the CTRL, Shift and function key 0 keys together. For regularly used key definitions, why not include them as part of your !BOOT file? Remember to include *FX228,1 though!

You can prevent a block of text being reformatted by the Format command by inserting a ruler with no right-margin '<' character immediately before it.

When you alter the page format of some text, the format of the first printed page is not always affected.

To make sure this doesn't happen ensure that you don't have any blank lines or text lines before any of the commands. If you do, the computer will print them before executing all the commands, so the commands will not take effect until page two.

Alternatively a separate file called COMMAND can be set up which contains only the command lines. Then on printing type:
PRINT COMMAND TXTFILE
and the COMMAND file will be executed followed by the printing of the textfile, TXTFILE.

You could of course include a variety of commands in various command files and use the one you require before you print your text file. This has the advantage in that you only need to define your commands once.

You can save part of a large document by first setting markers 1 and 2 at the extremes of the text you wish to save. Then enter command mode and type:
WRITE name 1 2
which will save the text between markers 1 and 2 under the filename given by 'name'.

If you omit marker 1 you can save all text up to marker 2; if you miss out marker 2 you'll save all text after marker 1.

You can insert a file into a current document by setting marker 1 at the point you want the file to be inserted, then going into command mode and typing:
READ name 1
The Read command can also be used to load in text SPOOLed form *Wordwise*.

One use of *View*'s 26 number registers (September '85, Wordprocessor Hints and Tips) is to allow you to relate your page numbering to chapters, by setting up registers C and P at the start of each chapter. Type:
SR C¦C+1
SP P 1
Page numbering could then be started by using a command such as:
DF //Page ¦C.¦P//
The pages in chapter 2, for example, would now be numbered 2.1, 2.2, 2.3, etc.

When using the Screen command, *View* turns paged mode on, so giving you a page of text at a time.

Paged mode can be turned off with CTRL-O. Pressing CTRL-N will turn it back on.

FREE ADS

SOLIDISK 128k sideways RAM with disc manual £110. Will sell separately as 32k baseboard £35 and 98k plug in £35. Phone Tony Colombat on 0942 488700 after 6 pm.

MEMORY 27128/250 and 6264LP15/150 suitable for ROM boards. The two unused for £6.50. Phone Harrogate 0423 872045.

DISCS on the cheap. 100k Tandon drive. £25. Complete with cables and formatting disc. Postage £2. Phone Harrogate 0423 872045 for an economy drive.

EPROM programmer chassis complete with disc software and full details. Programs 8k and 16k EPROMs. Complete with two unused 16k EPROMs. Needs 5 volt and 21 volt supplies. £16 ono. Phone Harrogate 0423 872045.

TRACKERBALL to suit micro User articles. Atari. Complete with info on converting it into an ordinary mouse. £12.50. Phone Harrogate 0423 872045 and help me to tidy up.

CHEETAH speech board as new £12.50. Phone Harrogate 0423 872045 for a chat.

ELECTRON Viewsheet ROM cartridge £12. Unused in original and undamaged package. Phone Harrogate 0423 872045.

RGB COLOUR monitor chassis (without case but with isolating transformer) works well with computer. Has to go. £75 ono. Phone Harrogate 0423 872045 to add colour to your life.

AUSTRALIAN BBC user searching for contacts to exchange tips info +. Write to Roger Jolly, PO Box 424, Camberwell, Victoria 3124, Australia.

WANTED Microvitec colour monitor in good condition. Medium resolution. Any reasonable price considered. Tel: (0691-81) 259, Oswestry area.

BBC As and Bs urgently required by unit supporting severely physically disabled children. Also any disc dives and printers. Please help Cause for Concern, 117 St. Johns Road, Exmouth, Devon EX8 4EH.

WANTED Pascal ROM will be prepared to exchange for another ROM or software. Contact Mik, 39 Irving Place, Blackburn, Lancs BB2 6LR.

OFFERS 100k Cumana + PSU disc drive. Acorn DFS. Mags: approx 30 copies of, Your Computer, C+UG, PCN. 16k 2×81 RAM pack. Broken 2×81 offers. Phone Godalming 6589.

WANTED Solidisk EFS for Electron Plus1. Must be in V.G.C. Pay up to £35 or swap for £250 software including Elite Repton, Overdrive and joystick interface. Write W Reid, 9 Primrose Bank, Wigton, Cumbria.

BBC B Acorn DFS OS1.2 plus software plus mags. Price £320. Tel: 01-349 4490 between 6-8 pm.

PENFRIEND and programs. Write to Ruud Burgel, Prunusstraat 35 4431DC, S-Gvavenpolder, Holland.

ELECTRON with Plus One interface. Excellent condition boxed with leads, user manual, advanced user guide and first 29 issues of Input magazine. Over 75 games including Elite £160. Tel: Lymm (0925 75) 2515.

WANTED. Acorn Electron mode seven adaptor by SIR Computers. Will pay all cash, or part cash and various goodies (including Atari 600XL). Tel: (0908) 564249 after 4 pm. Ask for Gary.

BBC disc drive 200k. Vgc. Boxed. £70. Printmaster and Graphics ROMs as new £18 each. Tel: (0203) 341529 after 5 pm.

TEAC 55E half height SS/DD 40/80 track disc drive cased/cables as new £68. Acorn Basic 1 and V1.2 DFS chips £8. Tel: Paul (0293) 515201 or write 9 Goffs Close, Crawley, Sussex.

BBC B, DFS, tape recorder, lots of software on tape and disc, programmable joystick, modem. Also Seikosha printer/plotter GP 700A. Will separate. Sell for £680 ono. Phone 021-550 7085.

UDM DDFS for sale. Up to 120 files per disc. Latest 3.1 version with disc sector editor disc. Three months old, as new £70 ono. Phone 091-262 7764 after 5.30 pm.

MICROVITEC colour monitor £120, Nightingale and Commstar £75, 6502 2nd processor £110, CGP 115 printer £35, AMX mouse £35. Pembroke (0646) 684961 after 5.30 pm.

WANTED BBC B computer in East Lothian. Preferably with disc and Wordwise. Phone evenings or weekends. North Berwick (0620) 3827.

BBC 1.2OS DFS very good condition £275. Software, recorder and manuals available. Little used. Tel: (0252) 877085.

BBC B, OS 1.2, Watford DFS, Teac 100k drive, cassette recorder, Gremlin, discs, magazines, books, tapes, etc. Excellent condition. Cost £900. Accept £450 ono. Tel: 01-994 7521 (weekdays) or 0604-714886 (weekend).

2K STATIC RAMs £2, Kempston joystick £8, Doctor Who game cassette £5, various Spectrum software, Beeb books for sale. Write for full list to Paul Stevenson, 19 Marland Hill Road, Sudden, Rochdale OC11 4PQ.

WANTED. Phloopy Drive cartridges. Contact Paul (0954) 211133.

BLANK DISCS, mainly Verbatim and 3M £10 per ten. Bigears speech recognition system, leads, and manual. Only £20. Tel: David on Dartford (0322) 29666 after 6 pm.

GRAPHPAD GRAPHICS tablet, complete with extensive software, £80 ono. Five inch colour television, no sound, but ideal as a display. Only £25. Tel: David on Dartford (0322) 29666 after 6pm.

BBC B 1.2 OS + Solidisk ADFS + dual 100k disc drives. Includes discs, manuals and leads £410 ono. Ring David on Dartford (0322) 29666 after 6pm.

MUSIC 500, programmable synthesiser for BBC. Vast range of complex sounds and facilities. No need to be computer programmer or music scholar. Controlled by its own language called Ample. £150. Mike 0297 52566.

PARFITT plotter DP025 as new, used rarely. Three colours. £240 ono. Tel: Peterborough 270 875.

CUMANA disc drive, CS100 100k, 40 track single sided perfect, boxed. With leads £80. Tel: Ash Green (0474) 873186 north west Kent area.

BBC B, Watford DFS interface, 80 track disc drive, ATPL sideways ROM board, B/W monitor + Wordwise, Exmon. £450. Tel: 01-642 1359, evenings only.

BBC B, disc drive, DFS, tape recorder, Voltmace joystick, 11 discs, £200 software, 60 magazines, various books — all in best condition – only £430. Might sell separately. Phone Gary on 0329 283589 now.

AMSTRAD CPC 464 colour computer including Basic 1, games software, user magazines, books, joystick, mint condition,

bargain £280. Phone Rochdale 353915, buyer must collect. Wanted Electron software, games and O level; local preferred.

SOLIDISK 32k sideways RAM 5 months old. In perfect condition with manual and utilities disc. Cost £59. Sell for £47 ono. Contact Gary. Tel: 021-356 2985.

WANTED sideways RAM for BBC B. Phone: Martin on 0302 770522 evenings only.

GERMAN Acorn user (model B, discs, 40Tr.) looks for contacts with English users. Please write to Sven Mohr, Grapenberger Straße 92, 3012 Langenhagen, West Germany.

KENDA double density DFS Page = &E00. Complete interface. Also 3" Opus disc drive and ten discs. Offers please WHY. 632 Signal Troop, RA Range, Hebrides Balivanich, Isle of Benbecula, Scotland PA88 5LN.

BBC Acorn Prestel adaptor little used for sale or exchange considered for BBC Acorn teletext adaptor plus DFS discs. Phone Chatteris, Cambs (03543) 5595.

CHEETAH speech synthesiser for BBC. Excellent condition with demo tape – ideal present – only £17. Also Aquarius computer, data recorder, cartridge, book with all boxes, leads etc. Vgc only £55! Telephone Southend 72193.

QUICKSHOT 1 joystick brand new. Sell for £8. Ring Ian 0223-880152. For good advice on latest games ring or write to Ian Jones, 40a Pierce Lane, Fulbourn, Cambridge CB1 5DL.

TORCH ZEP100 Z80 2nd proc. with perfect sofware £165, Apple II disc drive £40, Miracle WS2000 modem £80, Remex BBC double sided disc drive £55. Ian (0763) 41720.

PRINTER/Plotter 4-colour MCP40 with leads to BBC and 380Z, extra pens and paper £70 only. 021-426 5447.

PRINTER Brother HR5 very good condition inc. mains power adaptor and Beeb connecting lead £115. Original box. Write to M Bright, 31 Maitland Road, Russells Hall Estate, Dudley, West Midlands DY1 2NU.

HELP needed on adventures eg, how to get past the witch in Castle Quest. Will exchange Hints and Tips on most adventures. Tel: 0742-447593, or write to Kashaf, 226 Darnall Road, Sheffield S9 5AN.

WANTED quality modem, books on MS-DOS, hacking, IBM PC, Datastar Calstar any IBM type accessories. Contact Dawson 2 Stocks Court, Poulton-Le-Fylde FY6 7TA. Tel: 0253 886545.

BBC (B) 1.2OS with DFS & Wordwise. Single sided 40/80 switchable ½ height disc drive + 20 discs of s/w £500 the lot or split. Phone Anil 031-229 5953. Wanted: 3½ inch DS (40/80) disc drive.

WANTED: Acorn Electron Plus One expansion unit. Will pay around £30. Must be in mint condition. Seller must be around Lancashire, please. Phone Preston (0772) 612627, evenings only. Ask for Michael.

ACORN Electron, Acorn recorder, lots of books and mags. and 63 software titles. All in immaculate condition. Tel: Barnsley (0226) 288211 after 4 pm and ask for Neil. All for £140 ono.

WANTED! BBC – user/owner penfriends. Any country. Aged 16 – 20. Write to Christopher Perry, 32 Lightwoods Road, Pedmore, Stourbridge, West Midlands, England.

BBC B (with Basic II) excellent condition, colour television, joystick, tape recorder, many magazines, books and software from Acornsoft, Imagine, Ultimate, Micro Power and others. Sell for £465 ono. Ring Keith 01-808 8187.

BBC B Amcom DFS, Kaga green monitor, Mitsubish 80TK 400k disc drive, Kaga KP810 dot-matrix printer, View, games, books, magazines, +more! Ring for more imformation. Bargain £1050 ono. Bude (0288) 4682. Jonathan.

MODEM 1000 and ROM for BBC. Boxed with manual, lead. Hardly used and in full working order. For use with Prestel etc. £40 ono. Phone Chester (0244) 378411 or Prestel Mailbox 01-999 6035.

MICROVITEC 1431 colour monitor standard resolution. Very good condition. Original packaging £95. Phone Slough 681197. Ask for Jas (evenings).

TEAC dual 100k half height drives. Complete with leads, manual, and utilities disc. A bargain at £125. Tel: David on Dartford (0322) 29666 after 6 pm.

40 TRACK 100k SS drive – £90 ono. BBC Software F/S includes Elite, Crazy Painter (tapes) – many others – Phone Mark on (0703) 845371 after 5pm.

POCKET COMPUTER for sale. Sharp PC-1245 + 200 page manual. As new. Still in original boxing. Hope to sell for £27 ono. Please tel: Weston-super-Mare 419765.

We've changed the format of the Free Ads so that we can clear the backlog and no longer have to carry ads over from one issue to the next. The Free Ads are carried in the magazine as space permits, so please allow about three months for yours to appear.

FREE PERSONAL AD SERVICE

Sell your old hardware or pass on information. Fill in the form below to a maximum of 32 words (one in each box) and send it to Acorn User Free Ads, 141-143 Drury Lane, London WC2B 5TF. Please use capital letters, write clearly, and remember your name, address or telephone number. Without this full information, supplied on a separate sheet of paper, we regret that we cannot carry your Free Ad. This is a service to readers – no companies please. One entry per form only, and we cannot guarantee any issue.

SMALL ADS

■ **Centronics 739** printer ROM dumps colours, shaded, *command, printer control, Wordwise fkeyset, manual, utilities (tape/disc) £25. Electrocomp, 5 Polden Close, Farnborough, GU14 9HN. (0252) 510486.

■ **AC Circuit Analysis.** New program, menu driven, 30 nodes, transformers, frequency sweeps, pulse response, alternative values, £60. Details from Markie Enterprises, 17 Percy Road, Shepherds Bush, London W12 9PX.

■ **Problems?** R-SOFT utilities can help you! **1. How-to:** An essential collection of software and instructions for frustrated new disc owners who want to move their programs to disc. **2. Nutcrackers:** tape2tape + tape2disc + disc2disc + disc2tape. **3. Rompull** and **Tapedump. 4. Automatic Disc Menu:** Includes a sideways RAM version, can boot from ROM, works with 2nd 6502. **5. Autosol:** Will automatically boot your Solidisk with a preselected list of ROMs. **6. SWROM*:** puts your Basic/machine code programs in ROM format. **7. RFS-Generator:** Generates ROMs for the *ROM filing system. This does not use DFS workspace and is an ideal tool to run nasty programs from disc. All above packages £5 each; **How To + Nutcrackers:** £9. **D-Master:** Superb disc copier (is unprotected): £7. Many other utilities: Send for our list (SAE please). R-SOFT, 22 Marriotts Close, Felmersham, Bedford MK43 7HD. Tel: (0234) 781730.

■ **Triple** contains Twin to back-up valuable protected discs, Digger to display format information and contents of all readable tracks (and alter it if desired), and Dual to create your own 40/80 track discs. £10. Twin alone, £7. John Connett, Dene Croft, Westcott Street, Westcott, Dorking, Surrey RH4 3NY.

■ **Speech-Aid** 1000 words ready to speak plus invaluble speech creation utility. A must for all users of Cheetah's Sweet Talker. Disc only, send cheque/postal order for £5 to M Randall, 5 Redwood Close, Irchester, Northants NN9 7BX or sae for details (state 40/80t).

■ **Dust covers** for BBC A, B & B+ and Electron. Can still be fitted with Plus 1 & 3 attachments. Just send £2.99, stating computer. Allen Enterprises, Freepost, Luton LU2 8BR.

■ **Sideways RAM** 16k for BBC. Easy to fit, no soldering. Utilities software included. £22 inc p&p. RJR Electronics, 37 Heworth Green, York YO3 7SX.

■ **BBC B 1.2OS,** Cumana disc drive, Wordwise+, Brom, joy-sticks, all boxed, good condition, lots of software, only £590. Tel: Tonbridge 366966.

■ **Exam preparation;** 200+ question data banks: computers, chemistry, physics. BBC discs £13.50 each. Special Econet versions £27.50 each. BBS, 4 Chaomans, Letchworth, Herts SG6 3UB.

■ **EPROM** erasing and programming service. Very low cost. Also, Basic programs entered onto EPROM. EPROM available with CALCULATOR and METRIC CONVERTER programs for BBC B. Send SAE for details. Contact A Smith, 11 St. Clement's Close, Ardsley, Barnsley, South Yorkshire S71 5DD.

■ **Disc drive** Mitsubishi double sided £95. Also steel plinth, beige, £100. Phone 01-286 0489.

■ **Probability** for O and A level. 15 different experiments and demonstrations, plus objective tests and good graphics. Disc £12, tape £10. Sae for details to K Deadman, 16 Berkeley Drive, Kingswinford, W Midlands DY6 9DX.

■ **Gemini** integrated accounting system. Purchase ledger, stock control, invoicing and sales ledger, nominal ledger complete on 3″discs, £250. King, 4 Hillbrooke Rise, Ilkley, W Yorks. Tel: (0943) 601069.

■ **Ramfile:** The simple, fast database. 14k of records in memory. Saves/appends textfiles for wordprocessing. 40 or 80 track disc £12.50. Romfile (RFS) version £15. Archmac Software, 19 Loskin Drive, Glasgow G22.

■ **BBC B** plus Opus DDOS and 800k 5¼ inch drive, Acorn datarecorder, joystick and £200+ of books, software and discs; all for £430. Tel: Burnham-on-Sea, Somerset. Tel: (0278) 785340.

■ **Utilities** Formatter, verifier, Basic search and replace from only £2. Key strips printed, very flexible layout, also special *Elite* key strips only 30p. Send a 17p stamp for information and example key strip to Crabb Progs, Shrublands, Sherstock, Shaftesbury, Dorset SP7 9PT.

■ **Convert** your 80t drive to 40/80 switchable. MK II unit (cased) simply plugs in, £18. MK I kit – as above but requires soldering iron – fits inside drive, £10. PSU for 2 disc drives, top quality, complete with plugs & leads, £37. All prices include p&p. Magus Electronics, 33 Pool Lane, Winterley, Sandbach, Cheshire CW11 0RZ. Tel: (0270) 582748.

■ **BBC model B** OS1.2, Acorn DFS, manuals, magazines £250. Ramamp 32k sideways RAM/ROM with write-protect switches. Cost £59, accept £25. Durham (0385) 711236.

■ **Variable mains** power controller, up to 1kw. Completely optionally isolated and program-controlled from your user port. Made from inexpensive and easy-to-get parts. Circuit and constructional details £3.50 or sae for ready built units. P Robinson, 168 Firwood Avenue, Urmston, Manchester M31 1PN.

■ **Software** real-time clock, 9 new functions plus full documentation. Sideways ROM only £9.95. Why pay £30+? R Milsom, 21 Bishops Avenue, Worcester WR3 8XA.

■ **For sale BBC** micro plus monitor, Cumana disc drive, Ferguson computer recorder, Centronic GLP printer. All brand new. Various extras, package price. Phone: 01-828 0057.

■ **Walters WM2000** printer £150. Solidisk 32k SW RAM £35. R Hermon, International School of London, Crowndale Road, NW1 1TR.

■ **BBC B** 1.2OS: 200k double disc drive plus DFS. ROMs: Datagem, Wordwise, ViewSheet plus cashbook accounts and payroll. £250 ono. 105 Conway Road, Colwyn Bay, Clwyd. Tel: (0492) 49272.

■ **Acorn Z80** second processor, complete with manuals and software. Hardly used, excellent condition, £290. Tel: Barnsley (0226) 283100 after 5pm.

■ **Daisywheel** printer, Quen Data, letter quality, three months old, as new, leads & cover. Cost £300, sell for £200. 31 Howard Road, Newbury, Berkshire RG14 7QD. Tel: (0635) 45654.

■ **Two new** games for BBC B or Electron. 'Whist' and 'Dominoes'. Both games for £5 (tape), £7 (disc). C E Rowbottom, 12 Olive Close, Aston, Sheffield S31 0RR.

■ **Heat load** calculation program for the refrigeration industry. Calculate your loadings in under two minutes. Details: Robert Coomber, 2 Newton Avenue, Tonbridge TN10 4RP. Tel: (0732) 359984.

■ **BBC Z80** second processor, complete software and manuals. As new. Cost £346, will accept £250 ono. Bray, Tel: 01-219 4000 (day) or 01-582 7139 (evenings and weekends).

■ **BBC B,** dual Teac d/s drives, Torchcard, Philips monitor, Prism modem, lightpen, paddles, Perfect software plus other programs, £600 + VAT. Will not split. Phone Jenner, Winchester 63165.

■ **Basic Editor,** Machine code utility provides fast editing of Basic. Supplied on 40 track disc. PO/cheque £5 inc or sae for details: J Smith, 1 The Gardens, Stotfold, Hitchin, Herts.

■ **View 2.1,** ROM plus ISO Pascal £30. ATPL keyboard with Acorn M500 £120. Tel: IOW (0983) 406703, evenings and weekends.

SMALL AD SERVICE

ACORN USER'S

D I A R Y

Disabled by shy Hermann

Some people aspire to fame and notoriety, others have it thrust upon them. Two in the latter category are Messrs Hermann Hauser and Chris Curry.

A more shy and retiring pair would be difficult to find, and yet their names crop up everywhere.

One of the latest cropping-ups is in the Morley Teletext Adaptor ROM, as pointed out by reader Brian Sharrocks. The command to disable the chip is *HERMANN, and, so we are reliably informed, there is a Kid Curry in there somewhere too!

Communicating with the kid

On the subject of the Kid, it's getting a bit difficult to work out how *grata* a *persona* he is at Acorn. Since snaffling all the Communicator team from Cherry Hinton (a big leak from the Waterworks?), Mr Curry has had cause to install an Econet at his baronial Croxton Hall mansion.

And where did he go? Why, SJ Research of course!

Front page news

What do you think of our 'Murdochsoft' page in a *Fleet Street Editor* style? Sent in by someone who wanted to remain anonymous, it was done on *Pagemaker* with a mouse.

Astronomic bang

One launch which went with a bang recently was Cumana's Astron card. The assembled scribes were having their individual cards (blown on a BBC micro)

MURDOCHSOFT

EX-FLEET STREET Editor

A LONG WAY AWAY IN E1

The special Murdochsoft ROM is highly protected and brings you these exciting new options
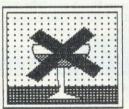
*DUMP	Gets rid of all those unwanted journalists
*BIRD	Supports dual density twin floppies
*RAMBLE ON	Switches on Bernard Levin
*£ ON	Prints out pound notes

What's in it for me? A quick look round

ADMINISTRATION
This is where you store the names of all the people you want to sack and all the TV stations you want to buy.

THE NEW OFFICES
Will not clash with opening hours as a special 'No Wine Bar' option ensures normal working even after 1100 hours.

Welcome to the new exciting world of publishing!

EX-FLEET ST EDITOR

gives you everything you need to produce a professional looking newspaper. No messy machinery, no adjacent wine bars, no cumbersome union agreements, no awkward journalists, just you and your own insatiable lust for power!

"It's absloulutely the bestt packagge I*ve ever used for producing a newspaper. Totally professional results and noone of that messytypesetting or odd bits of text running of the edge of Rupert Murderch- The TIMeS"

EX-FLEET STREET EDITOR uses the unique EL VIN.OS operating system.

Automatic regurgitation of Conservative party propaganda.

Replaces word 'large' in all copies of SUN with the word 'Whopping'

Ignores any previous agreement with union managements.

What you will need.

So you want to be a newspaper owner? All you need is about fifty million quid, no qualms and a lot of nerve. SEND NOW!

---

read and dumped to an Epson printer through an intelligent black box when a bulb fell from a chandelier at the Gloucester Hotel. Bang! The bulb hit the (luckily thick) carpet, narrowly missing an assembled group, and a whole section of lighting was plunged into darkness.

The Swedish government ap-parently asked for a quote for eight million cards, which, Don Bolton pointed out, is about the population of the country! 1984 might be late, but it's still coming.

Ultimate answers

Ringing round to try to sort out software compatibility is an ardu-ous task at the best of times, but some companies act plain stupid. Take Ultimate for example.

Their response on *Nightshade*, a great game and a big seller, went like this:

Electron, 'no'; B+, 'possibly, but no guarantee'; Master, 'never heard of it.'

Come on lads, play the game.